THE HEATING AND VENTILATING MAGAZINE

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Sketch Details of Heating Installations

Prepared for Use of New York City Board of Education

BY FRANK G. MCCANN

The Building Bureau of New York City's Board of Education has in its charge about 550 buildings used for school purposes, each borough having its staff of inspectors. In addition, new buildings are being constantly started, so that school houses, capable of seating more than 50,000 pupils, are always under construction.

With so large a territory and so many inspectors, there is great need of a thorough systematizing of methods. The same contractor, for instance, may be doing work for Inspector A in one borough, for Inspector B in another borough, and for Inspector C in a third borough, and as each inspector, if left to his own judgment, would perhaps require the work done differently from that of the others, the contractor is likely to become hopelessly confused by the varying methods, besides being unfairly dealt with.

In order to avoid such a possibility regarding the heating and electrical equipments of all these buildings, which are in his charge, Mr. F. G. McCann, engineer of the Board of Education, and assistant to Mr. C. B. J. Snyder, the Superintendent of School Buildings in New York City, has prepared special sketch details of various portions of the heating and electrical installation, some illustrations of which accompany this article.

Fig. 1 is a sketch of dry and wet returns run on the floor below the steam main, but above the boiler water line, as in unexcavated portions of buildings. It will be noted that the steam supply to each riser drops at an angle of 45 degrees from the steam main, thus draining the steam main at each riser. The drip from each riser is connected into the wet return main, and as the riser valve is in the vertical riser, the drips from steam main are always open.

A return manifold or header is shown with the separate return risers (one from each direct and direct-indirect radiator and coil supplied from the corresponding steam riser) connected thereto, with a check valve in each such return sealed with at least 8 inches of water.

Each steam riser has a globe valve and each return header has a gate valve, so that riser and all radiation supplied thereby can be closed off from mains in case of necessity.

Connections are also shown to overhead or ceiling coil, and to radiator set on boxing (or on floor) over return mains. As these radiators are below the artificial water line described hereinafter, a dry return main is run alongside of the wet main and is connected into same below the water line of boilers. In case temperature regulation is required in rooms heated by such radiators, thermostatic (pneumatic) valves are provided on both steam and return connections, the pneumatic valve in steam connection being placed at the

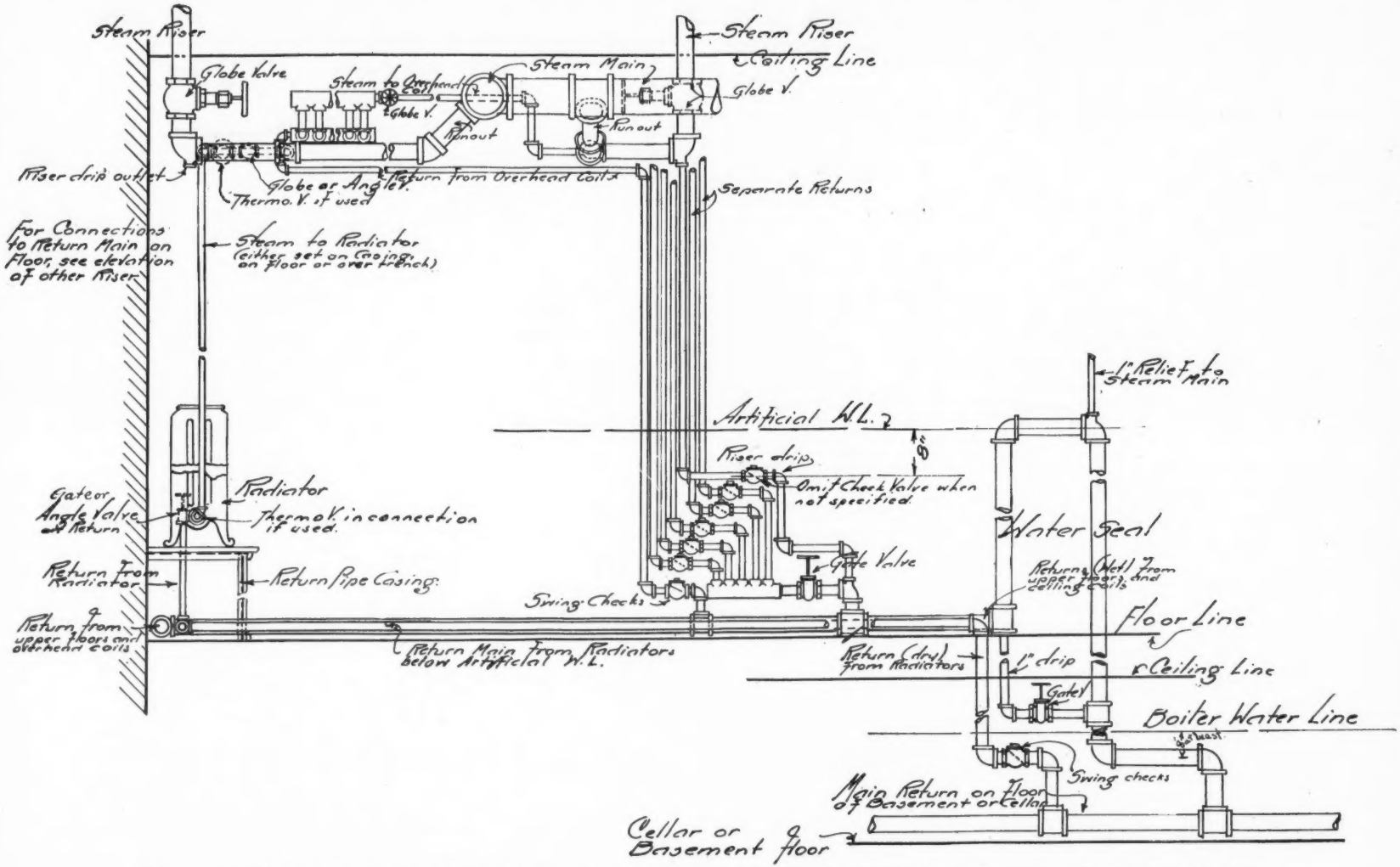


FIG. 1. SKETCH OF DRY AND WET RETURNS RUN ON FLOOR BELOW STEAM MAIN, BUT ABOVE BOILER WATER LINE

highest point in runout from steam main or riser runout, so as to avoid filling drop leg of radiator connection with condensed steam when thermostat closes off the pneumatic valve.

It is, of course, understood that dry return main, as shown on Fig. 1, is only needed when radiators or coils are placed below the artificial water line.

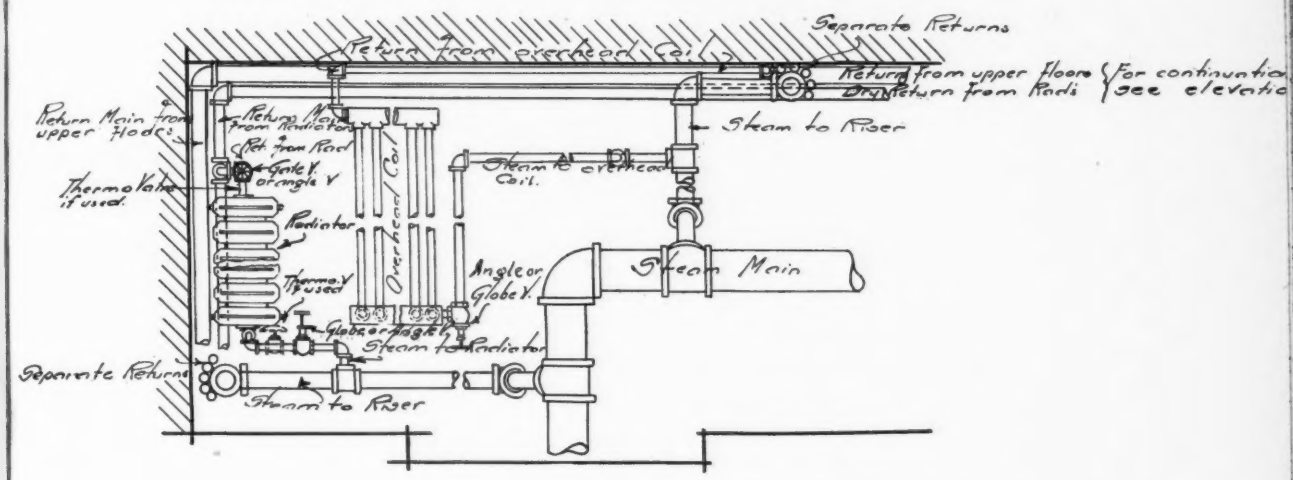
The artificial water line mentioned above is shown in both Figs. 1 and 2. In the former case the artificial water line is below the steam main, and runouts to risers, and in the latter case the artificial water line is above the steam main, runouts, coils on ceiling, etc., and a different system of return and drip mains is needed, as is shown in Fig. 2. In passing, it should be noted that each water seal used to create an artificial water line is provided with a 1-inch valved bypass for use in draining the heating system, if needed, and a 1-inch relief or equalizing connection is made from top of seal to top of steam main, to break the siphon action which would otherwise drain the seal every time it filled full enough to overflow into the lower return main.

Fig. 2 shows a sketch of overhead steam return and drip mains, used where returns run through coal bins or in front of doors, etc., making an overhead return main desirable. The runouts from steam main to steam risers are as before dropped on an angle of 45 degrees from steam main, and have globe valves in vertical portion of risers, but as the artificial water line in the general or wet return main is above the runouts, the drips from said runouts are connected into a dry drip main.

This drip main is hung below steam main and is connected into lower return main with a check valve placed below water line of lower wet return.

The return headers are shown made up in horizontal position, as close up to ceiling as convenient, and checks in same are sealed by artificial water seal, extended through floor, if necessary, to seal some headers made up near floor above. This general (wet) return main may be above steam main or below same, as is most convenient, as it does not affect steam main as to water in same.

As the ceiling coils are below this wet return, they cannot be connected to same without flooding the coils, and through them the steam main, etc. It is not deemed advisable to connect these coils into the dry drip main, into which the steam main drips through the riser runouts, as this dry drip main is filled with practically the same quality of steam as the steam main, and the coil surface connected to drip main on return and to steam main on supply would be



PLAN OF FIG. 1

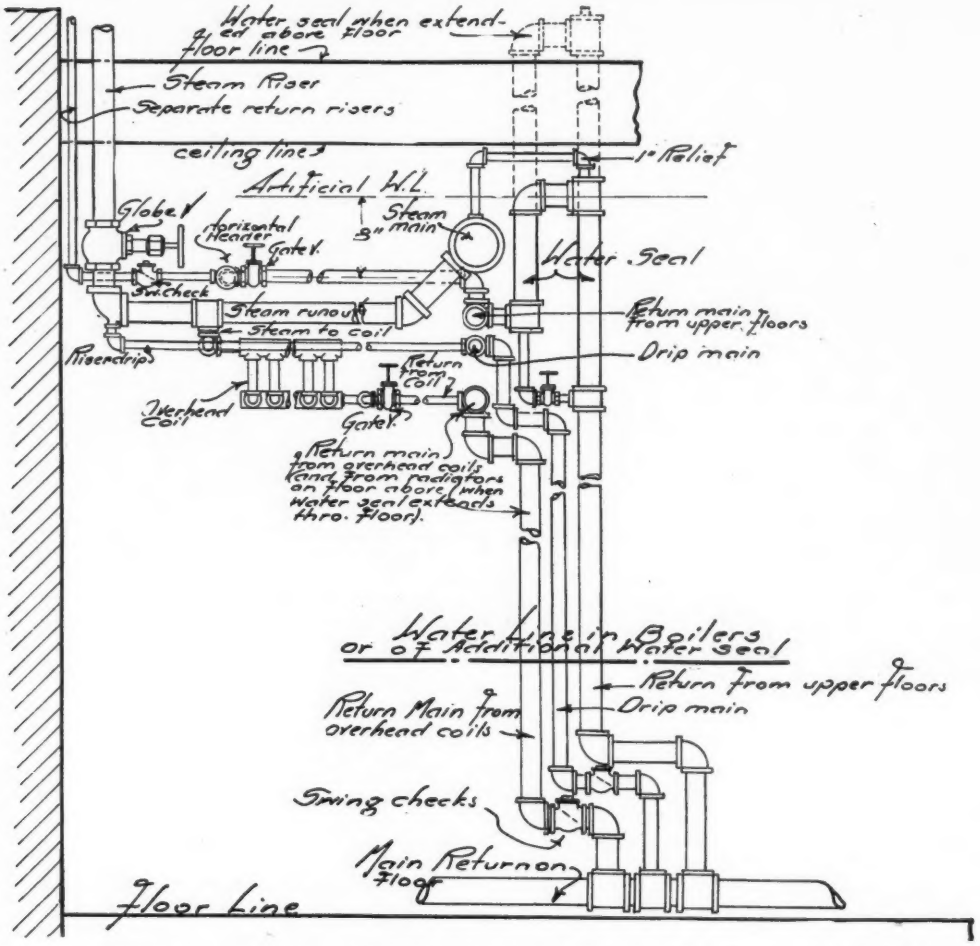
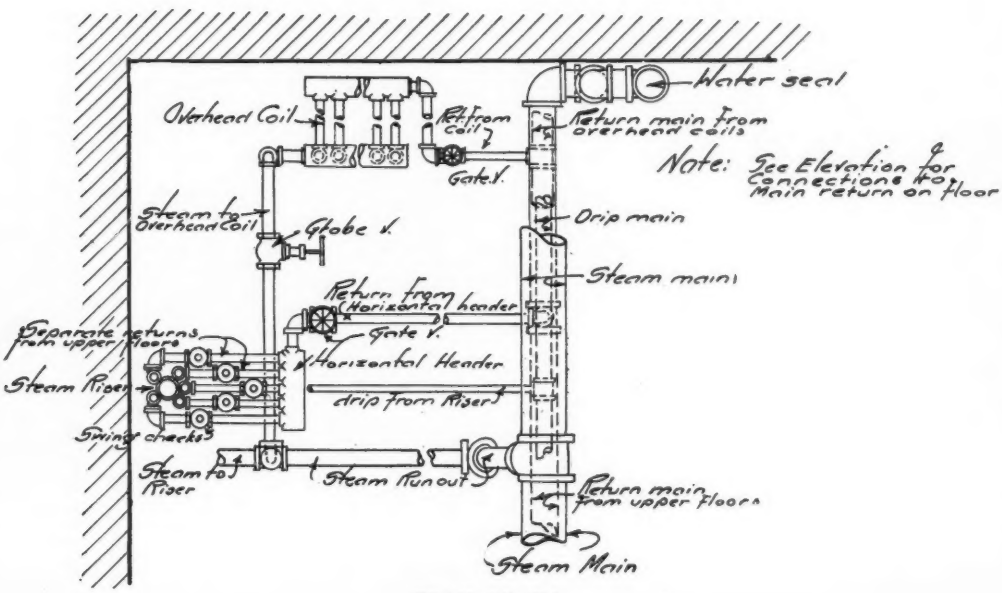


FIG. 2. SKETCH OF OVERHEAD STEAM RETURNS AND DRIP MAINS. USED WHERE RETURNS RUN THROUGH COAL BINS, ETC.



PLAN OF FIG. 2

fed from both ends simultaneously, thereby becoming air bound.

A separate dry return main is therefore provided for overhead coils which has very much less likelihood of short circuiting steam into both ends of coil, especially in cold weather, when full capacity of each coil is needed.

Where the artificial water line extends above floor of story above steam main, the radiators on floor of said story are also connected to this dry return main and have thermostatic valves on both steam and return runouts.

The use of a separate return riser for each radiator and coil gains several advantages over the customary two-pipe riser, the principal advantages being:

There is only one thermostatic valve for each radiator so connected, thereby lessening to a considerable degree the cost of installation and maintenance. Where hand valves are used, only one valve is needed, thereby lessening cost and rendering unskilled attention more positive, and obviating danger from freezing, due to leaving return valve closed with steam valve open.

Short circuiting, resulting in air-bound (hence very inefficient) radiators, is entirely avoided. The cost of installing such separate return risers is less than for the two-pipe risers, regardless of the less cost of thermostatic system, as the labor is very slight in erecting said separate returns, which are ¾ or 1 inch, according to surface drained thereby.

Fig. 3 shows the air tank, connections, etc., where a compressed air starting device is provided to assist in starting the gas engines used to drive blowers for ventilation, in connection with low-pressure heating and ventilating systems.

In such low-pressure heating systems, the compressed air for use in the thermostatic system of temperature regulation, is obtained from an air compressor driven by a direct-connected gas engine of about one horse power, which is easily started by hand. This supplies air to a large air storage tank tested to 150 pounds, and provided with safety valve set to blow at 100 pounds. Connection is made from this air storage tank to the cylinder of the large gas engine and also through a pressure reducing valve to the regular air tank and house air lines of the thermostatic temperature control system.

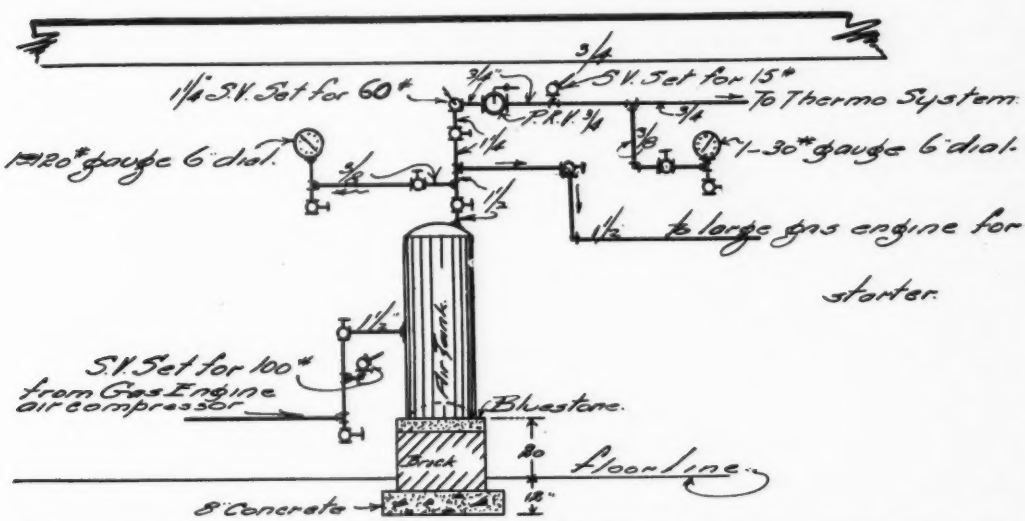


FIG. 3. AIR TANK, CONNECTIONS, ETC., AS ARRANGED FOR USE AS A COMPRESSED AIR STARTING DEVICE

It will be noted in Fig. 3 that the air tank connections are each provided with a globe or angle valve, as close to tank as possible. This is done

so that whatever pressure of air remains in the tank when air is no longer needed for the day, may be held in tank over night or holidays until needed, and as each joint is a probable source of leakage, as few joints as possible are allowed between tank and stop valves.

The two valves on the tank inlet connection are arranged so that the operator can open the lower valve to relieve all air pressure from compressor when starting same, and when the compressor is well started, with one hand he opens the tank inlet while with the other hand he closes the lower or relief valve, thus gradually throwing the load onto the compressor and its gas engine.

Each gauge is provided with stop cock and with draw-off cock, so that it can be tested and replaced, if necessary, while the air system is in use. As the pressure reducing valve does not operate well under so wide a range of pressure as from 100 to 15 pounds, a safety valve set at 60 pounds is placed on tank side of same so that pressure in tank (raised to 100 pounds, is necessary for gas engine air starter) is relieved to 60 pounds before turning same onto pressure reducing valve.

As an additional precaution against damaging thermostats and pneumatic valves, a safety valve set for 15 pounds is also placed on the house air-line connection. Pressure gauges are provided for determining the pressure in tank and in house line outside of pressure reducing valve, close to the latter, so that safety valve and pressure reducing valve can be conveniently adjusted to a nicety. An air-pressure gauge is also placed on same board with steam gauges at front of boilers, so that the fireman can readily keep track of air pressure on house lines.

None of these sketches attempt to do more than show general details, and they are not intended to be scaled.

Mechanical Principles of Pipe Threading

By Frank N. Speller

Wherever a simple mechanical operation, such as threading the end of a pipe, is repeated many thousands of times daily on hundreds of tons of material, it is to be expected that those points which influence the cost or finish of the work receive close attention and study. The manufacture and use of dies for this purpose within the same mill naturally furnishes exceptional facilities for collecting experience as to what gives the best service in practice. Frequent inquiries are received regarding the best method of shaping die chasers, indicating that many are experiencing difficulty in making good threads with dies in common use. A few of those features of die construction, which experience has shown to be most essential, are here touched on briefly for the benefit of any who may see need of economy and better results in the threading of pipe.

The operation of threading is analogous to lathe work; the chaser or cutter in the die being similar to a set of lathe tools, the metal being removed in much the same way in both cases. When a smooth-cut finish is desired, the angles of rake and clearance are adjusted with care to what is calculated to cut away the metal in the cleanest manner. Since a metal to metal contact should be obtained in the threaded joint, it is evidently important that each face of the thread should be as smooth as possible, hence in shaping the cutting parts of dies those points fundamental in lathe work are naturally worthy of our careful consideration.

The diagram opposite is for the purpose of illustration, with certain features slightly exaggerated for the sake of clearness. It shows an incorrect form of chaser (A) and opposite one correctly shaped (B).

The angle (N) is termed the "rake," and is varied slightly where refinements are desired, according to the size of the pipe, as experience has shown to be best. The table below refers to machine dies. An angle of 15-17 degrees will be found quite satisfactory for general work with hand tools:

Nominal Pipe Sizes.	Angle N.	Size.	Angle N.
1-inch	24 degrees	6-inch	20 degrees
2-inch	23 degrees	8-inch	18 degrees
3-inch	23 degrees	10-inch	17 degrees
4-inch	21 degrees	12-inch	16 degrees

Without sufficient rake the metal is "torn-up-by-the-roots," instead of being cut away clean. This results in a ragged ill-fitting thread, excessive wear on dies, and waste of power.

The material of which the pipe is made has some bearing on the rake required. For example: very crude wrought iron carrying 2½ to 3 per cent. foreign matter can be threaded fairly well with the cutter shaped as in "A." The next piece, however, may be tougher and more ductile, and will, therefore, require a die with more rake. Soft Bessemer steel, of the grade made specially for welding, may be classed somewhere between the various grades of iron in respect to the rake required, one advantage which it possesses over iron being comparative uniformity. Although it is difficult to thread steel and certain grades of pipe iron without rake on the dies, it is a matter of daily practice to thread all the material above mentioned with the same dies provided the rake is set near the degree given above which is adapted to the toughest material likely to be met with in wrought pipe.

Referring to the diagram, it will be noticed that the cutter (A) bears on the work for the full width of its thread. In (B) a method of relieving is applied. The friction due to no relief or clearance materially increases the power required and the chance of stripping the threads.

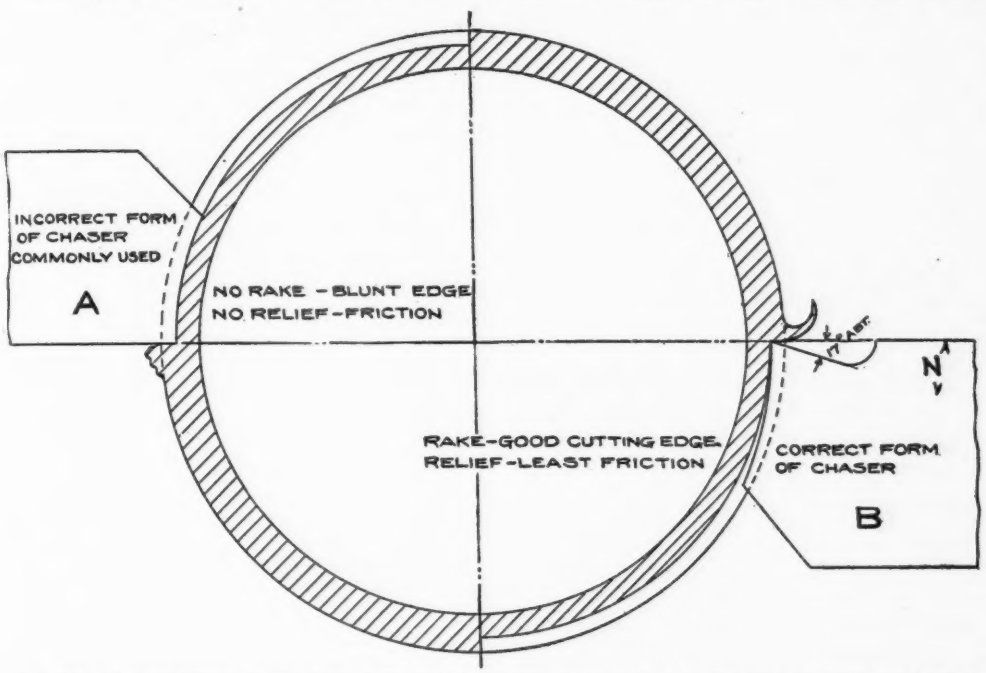


DIAGRAM SHOWING CORRECT AND INCORRECT FORMS OF THREADING DIE CHASERS

There are many other points, such as sufficient chip room, rigidity of cutters, and the grinding away part of the first four or five teeth to facilitate starting, which have to be considered. Liberal lubrication is too clearly necessary to require mention, and yet is a frequent cause of trouble when neglected. In case genuine

lard oil is not available, crude cottonseed oil will be found quite as good.

Since hand dies of simple construction must always be used to a greater or less extent in erection, it is desirable that the above features which form the basis of shop-threading practice, should in so far as possible be applied to field tools, so that the fitter will be able to produce, without excessive work, a thread equal to the best made in the shop. Two perfect threads are required to make a good joint, and it is evident that if one has an uneven surface, that it will probably not fit a standard fitting or make a tight joint.

Some of the most enterprising of hand tool makers have made use of these principles without increasing the cost of the die, and it has been experimentally proved that all the common forms of dies can be so made without any serious difficulty.

To compare the actual pull required in threading the same pipe with various dies before and after altering, a number of tests were run, average results of which are given below. Some of the dies tested had been in use after alteration for two months, but gave as good results as new ones:

Die.	On Steel.	On Iron.
No. 1. "Solid," common form	135 pounds	95 pounds
No. 2. "Solid," with rake and relief	75 pounds	60 pounds
No. 3. "Armstrong" Type, common form	125 pounds	80 pounds
No. 4. "Armstrong" Type, altered as No. 2	75 pounds	60 pounds

Aside from the truer threads obtained, it can be safely concluded from service tests extending over several months, that with hand dies so shaped the power required may be reduced 100 per cent., while at the same time the life of the die is increased in about the same proportion.

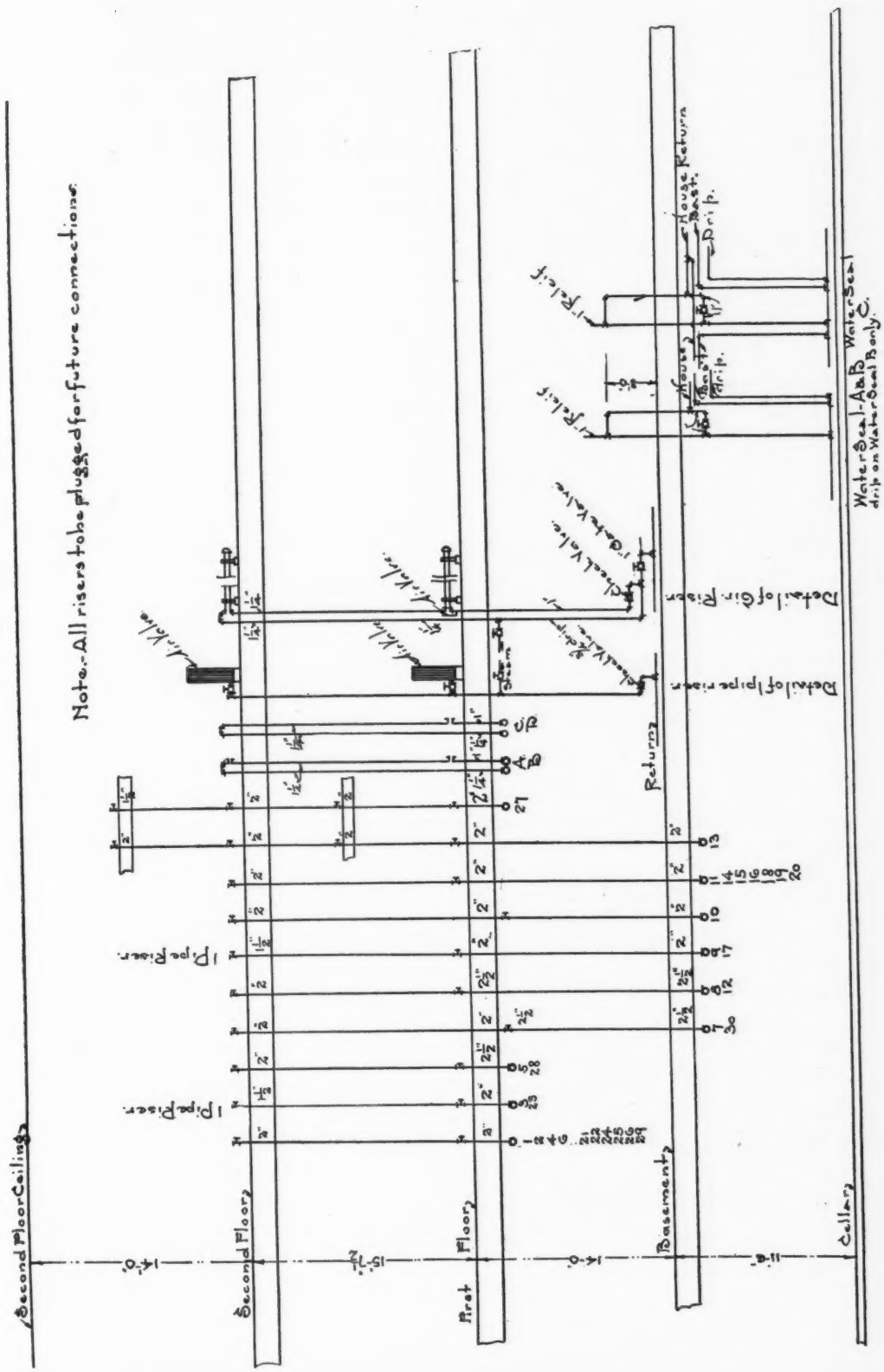
Heating and Ventilating a Medium-Sized School Building

In our September, 1905, issue appeared a description of a type of heating and ventilating system that is being used in some of New York's largest school buildings. Such buildings, nowadays, being broken up as they are by auditoriums, gymnasiums and other large apartments, require considerable planning in the location of the piping as well as of the ventilating apparatus, the latter frequently consisting of two or more blowers located in widely separated parts of the building.

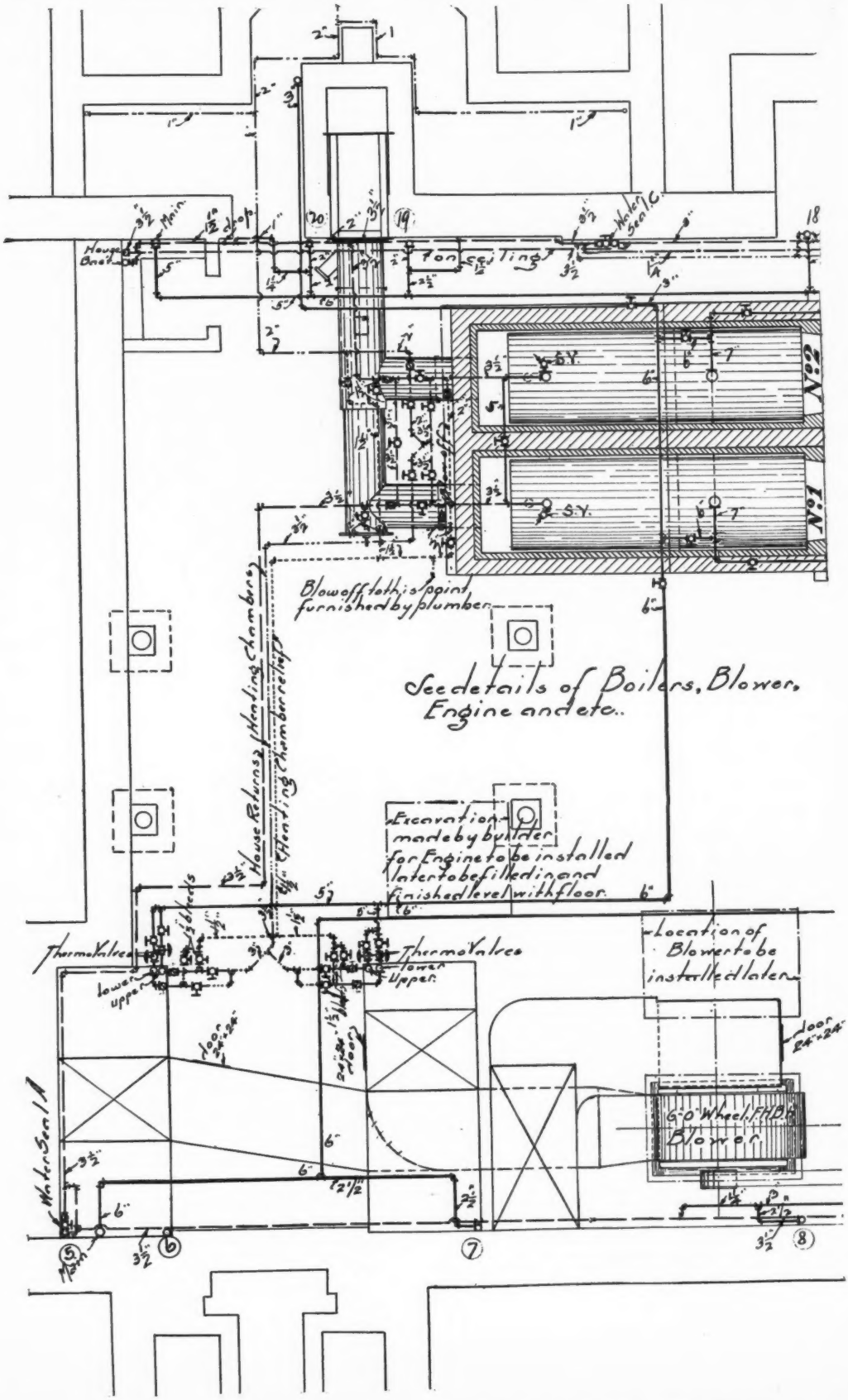
In a school building without these large apartments it is usual to concentrate the ventilating plant at a central point, whence the tempered air is distributed with comparative ease to the different floors. A description of such a plant is particularly interesting when read in the light of the observations of an English engineer (to be found in another column) who compares the methods in vogue in New York and Boston with those of other cities, especially Chicago. It will be of interest to know in this connection that it is our purpose to publish typical heating and ventilating plans of school-house buildings in other cities from which many of the differences in practice may be compared.

The building illustrated herewith is Public School 132, in the Bronx, New York city. As will be noted by the plans, the building is heated by both direct and indirect radiation, steam being furnished by two horizontal, tubular low-pressure boilers. The boilers are each sixteen feet long and five feet in diameter, and are fully equipped as regards fixtures.

An overhead tramway to carry the coal to the ash pit and the ashes to the ash hoist is erected in the cellar as shown. The rails are 5x3x⅜-inch angles, milled, half round on top edge and secured to hangers by means of

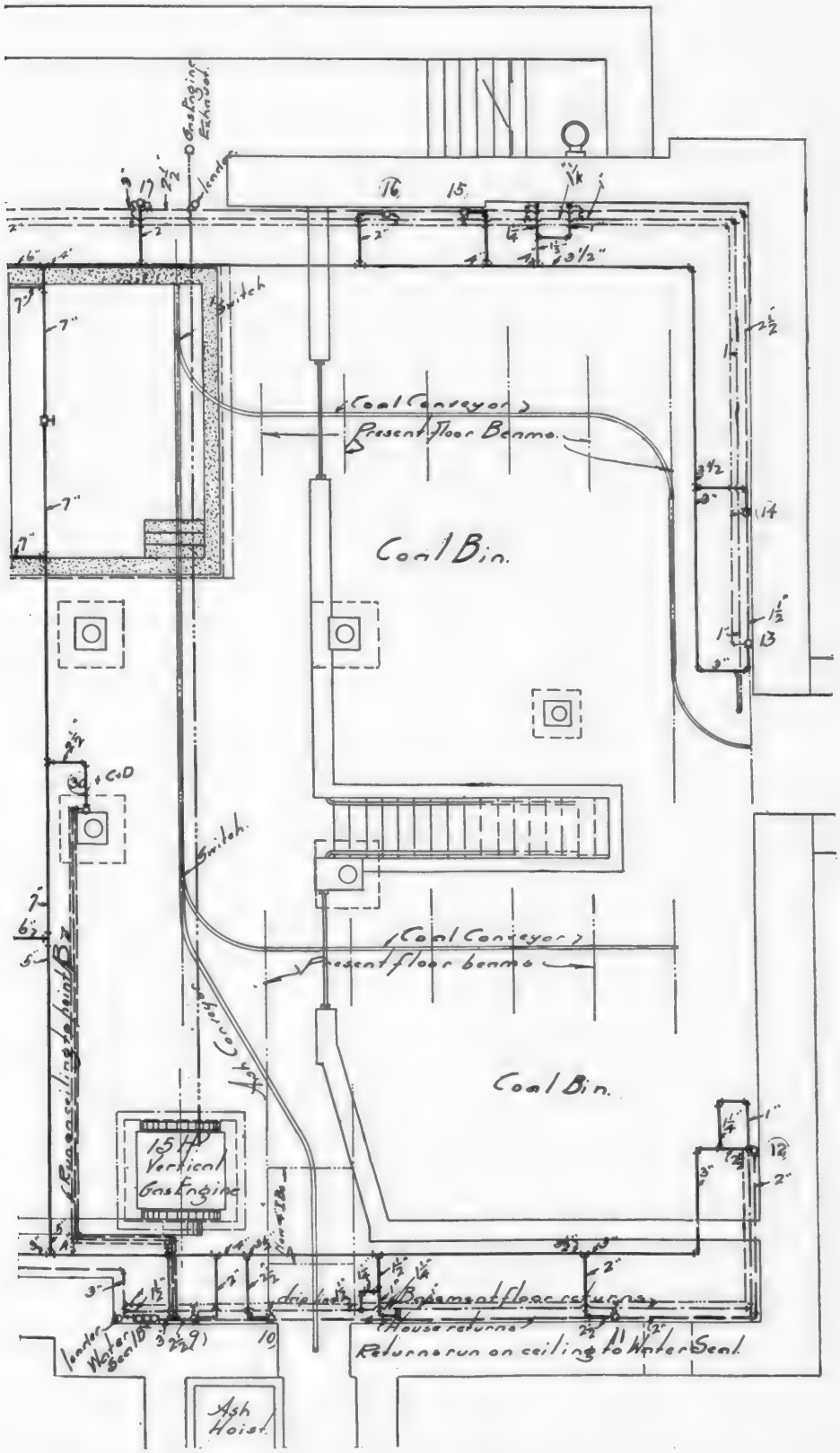


RISER SHEET, PUBLIC SCHOOL BUILDING NO. 132


Blow off to this point furnished by plumber
See details of Boilers, Blower, Engine and etc.
Excavation made by builder for Engine to be installed later to be filled in and finished level with floor
Location of Blower to be installed later
Thermo Valves
Lower
Upper
6'-0" Wheel, F.H.P. Blower
Water Seal
Main
Door 24"x24"

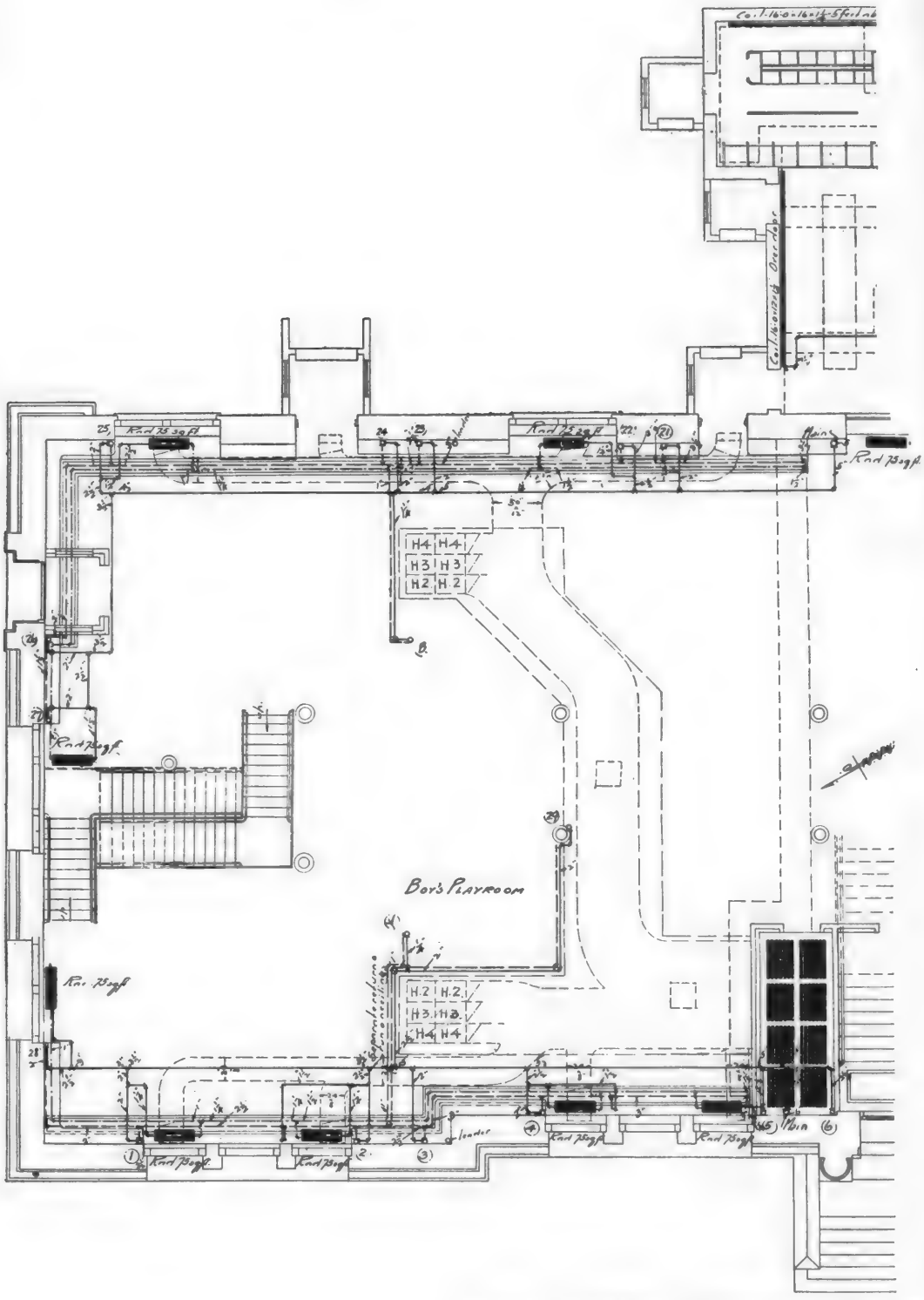
CELLAR PLAN OF PUBLIC SCHOOL NO. 132,

BOILERS AND PIPING ARE DESIGNED FOR SIXTEEN ADDITIONAL

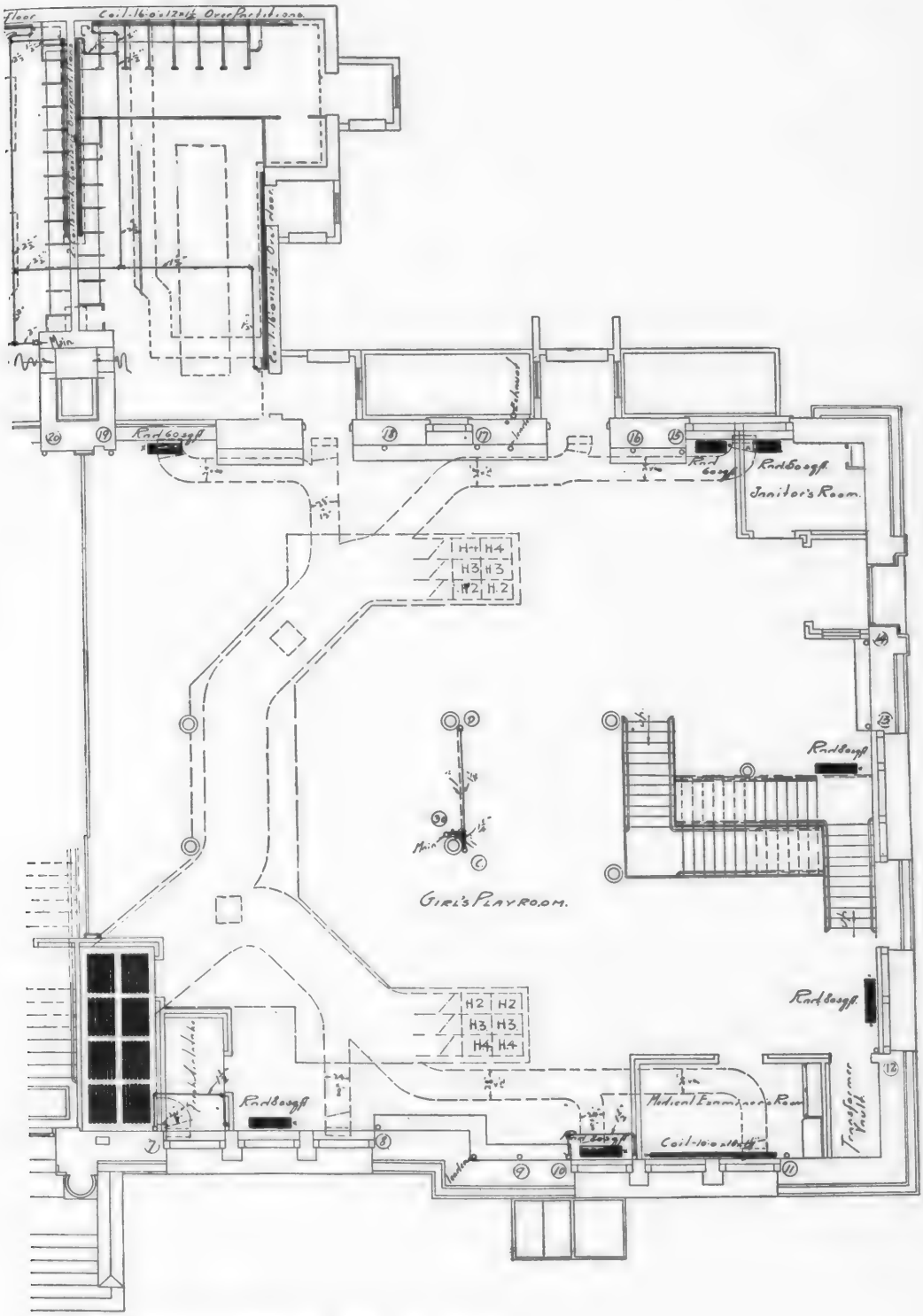


SHOWING HEATING AND VENTILATING APPARATUS

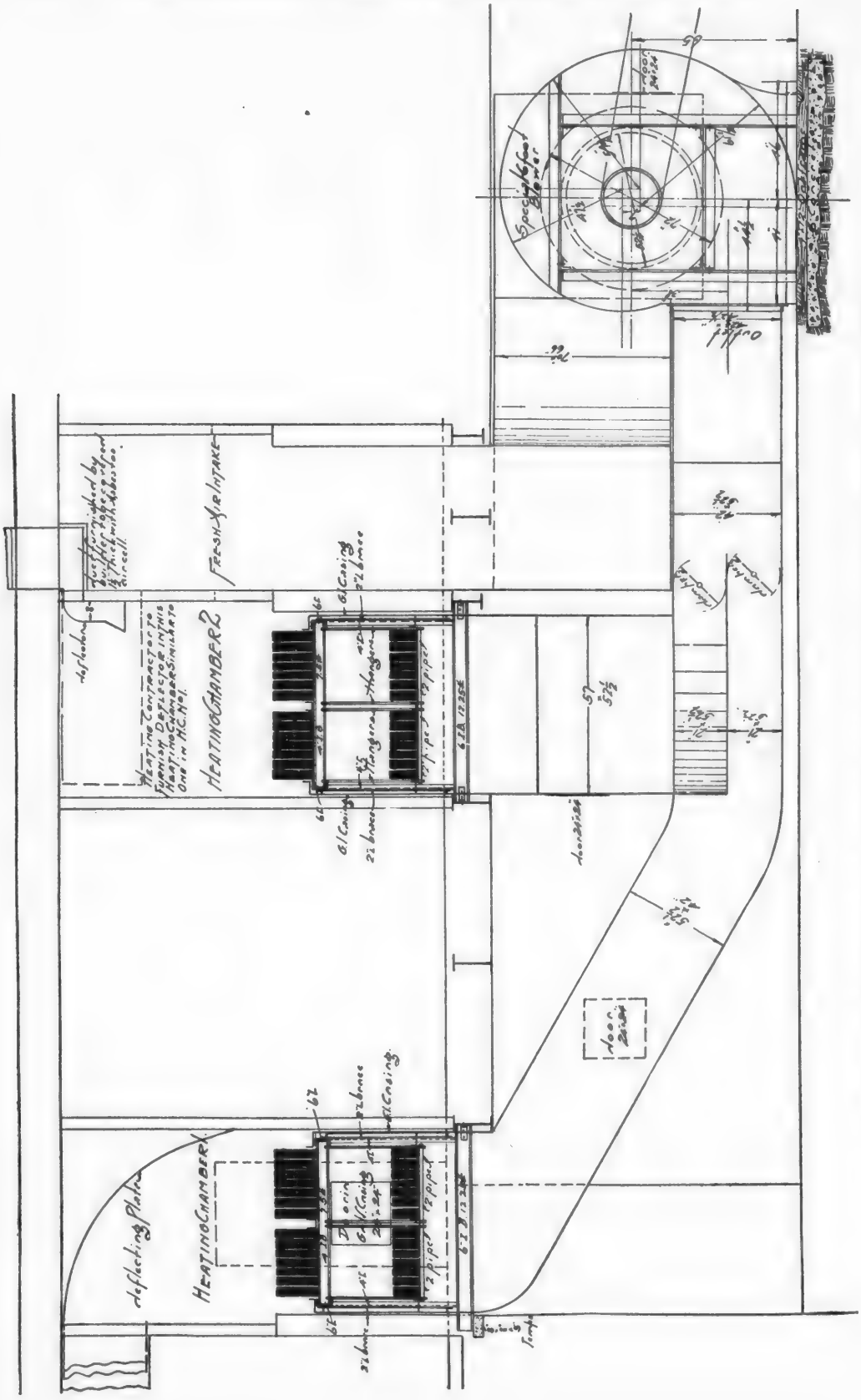
CLASSROOMS IN TWO STORIES TO BE ADDED LATER



PLAN OF BASEMENT, PUBLIC SCHOOL, NO. 132,



SHOWING ARRANGEMENT OF HOT AIR DUCTS



SECTIONAL ELEVATION OF BLOWER AND HEATING CHAMBERS, PUBLIC SCHOOL NO. 132

angle knees and bolted to hangers and to rails. The structure is designed to sustain a load of 1,500 pounds, and is fitted with a four-wheel, ball-bearing trolley with self-dumping and self-righting hoisting coal tub of 500 pounds capacity.

HEATING MAINS

The sizes of risers will be found on the riser sheet. The main vertical steam pipes from each boiler to connect with the main horizontal steam pipes near the ceiling, are seven inches in diameter. The mains and returns are so connected with each boiler by valves, swinging checks, etc., that each section or both can be used with either boiler separately or together. A separate six-inch supply pipe is run from a point near the boilers to the heating chambers and a separate steam main is run also to the pupils' water closets.

The boilers are connected with a 5-inch loop at the rear end with globe valve in same so as to allow the boilers to be used separately or together. The horizontal return main is 3½ inches in diameter at the rear of the boilers, and is connected into each boiler through a gate valve. A separate system of returns is run for the radiating surface in the basement at the west end of the building. The return from each heating chamber of 3-inch pipe is run separately back to the boilers. The heating mains also supply a snow-melting apparatus made of 1¼-inch steam and water pipes connected with the Y-fitting and the boiler room from which 1¼-inch delivery pipes are extended through the walls into the open yards. At this point a rubber steam hose is attached to the pipe.

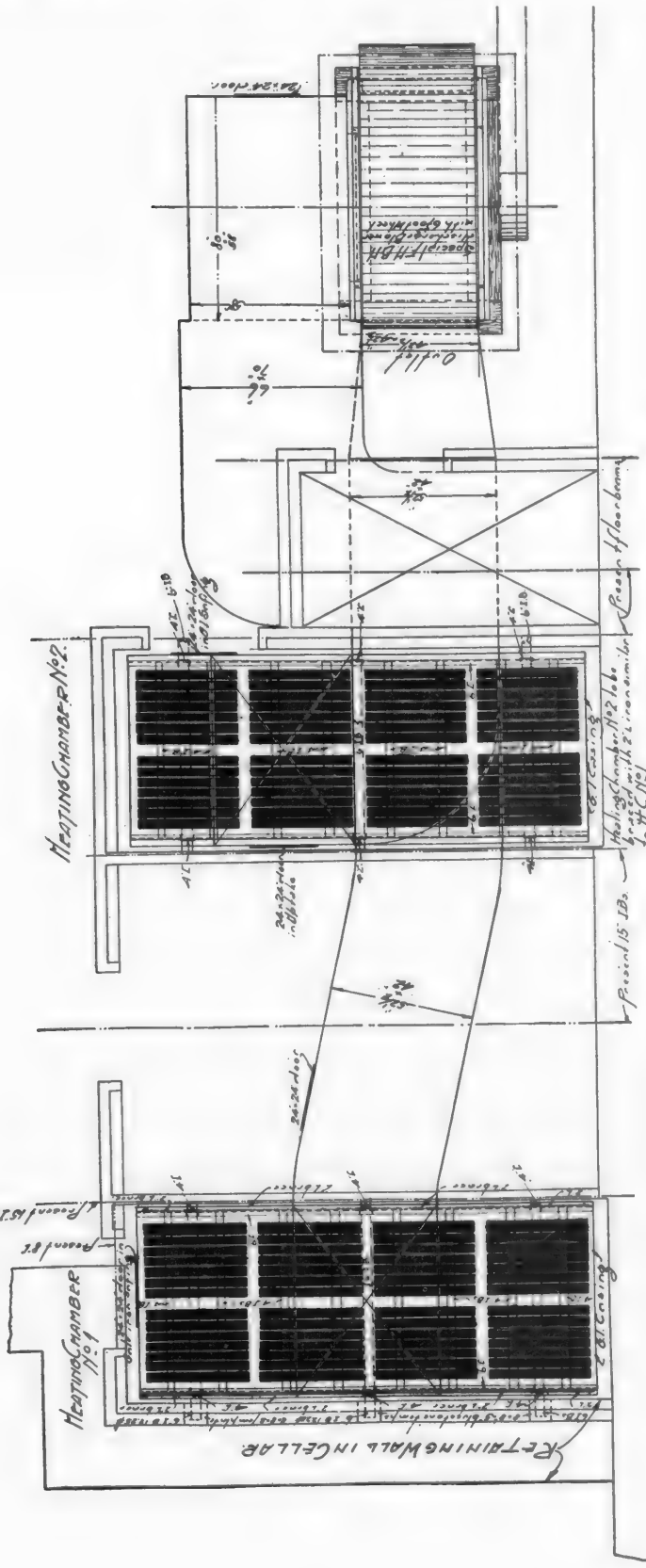
VENTILATION BY BLOWER SYSTEM

One special full-housed, steel-plate blower furnishes the ventilation for the building, the wheel being 6 feet in diameter. The blower is designed to operate at the rate of 240 revolutions a minute. The mode of power is supplied by a 15 H. P. gas engine connected with a 11-inch belting. Sixteen rooms are equipped with temperature regulation. It should be noted in this connection that the air risers are arranged to provide for the future addition of two stories, which will contain 16 additional class rooms.

DIRECT RADIATION

All risers have plugged tees in the second story for future connection. The return risers from all radiators and coils connect near the basement floor into branch tee headers having 1½-inch run and then through 1½-inch valves to the main return by short nipples; not more than 6¾-inch returns are connected into one header. Certain coils in the wardrobe are what are known as circulating coils, each made by running a 1¼-inch pipe up to the upper coil of the series, then dropping down with coils formed by off-setting the return riser.

It will be noticed that radiators containing not more than 80 square feet of surface in wardrobes are connected on the one-pipe system. Such radiators have gate or angle valves in connection, which, for radiators not exceeding 40 square feet of surface, are 1¼-inch, and for larger radiators, up to 80 square feet, are 1½-inch. Each direct radiator and coil of 60 square feet of heating surface or over has a separate full 1¼-inch steam connection direct from the main riser. The coils are made of straight 1¼-inch pipe with headers or close return bends. Those on the ceilings are miter or angle coils, each supported by ¾-inch bolts clamped to the beams. Coils for side walls and at the floor are made with close return bends and have a clearance of 2½ inches from the walls. Double coils have a steam and return valve on each section. Some of the radiators, including those in the principal's room, as well as the coils there, also all radiators in the assembly room, and in the class rooms, including the kindergarten, have front screens extending from 1 inch above the top of base to within 1 inch of under edge of top and about two inches around the ends of radiators; they



PLAN OF BLOWER AND HEATING CHAMBERS, PUBLIC SCHOOL NO. 132

are of the full width of coil. Where radiators stand 18 inches or less from the seats, the outside screens are doubled with an air space of one inch between sheets. All coils in wardrobes have wire screens.

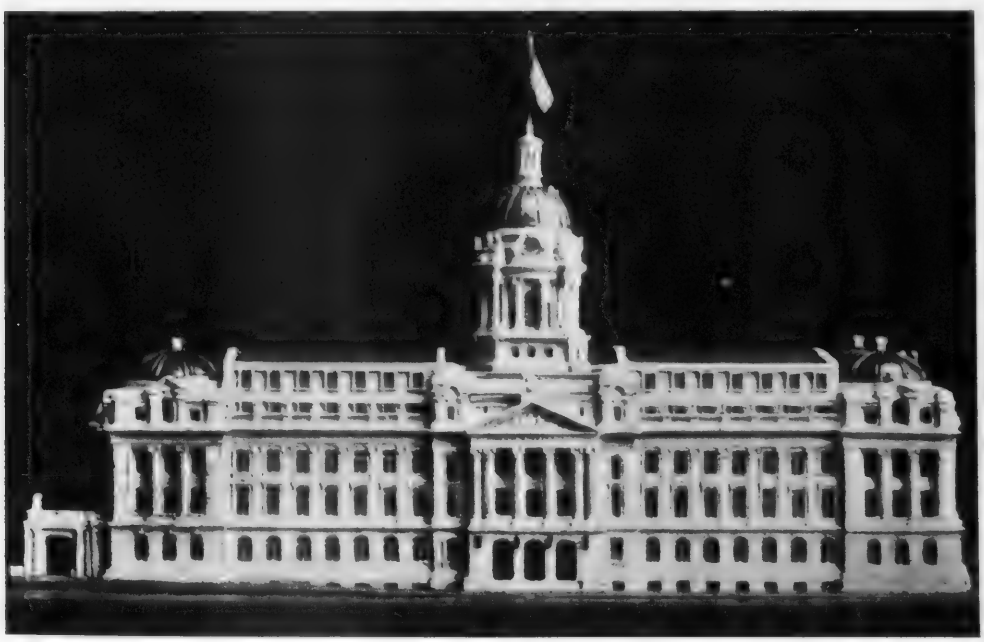
INDIRECT RADIATION

There are two heaters in the central heating stack, each made in two divisions. There are eight groups in each division, each group containing seven sections, thus making 1,960 square feet for each chamber. The sections of these groups measure 3¾ inches centers with a 2½-foot space between the upper and lower divisions. The steam pipe to each chamber is five inches, as stated, and the returns 2½ inches from each division. A 2-inch steam supply pipe connects with each group, with a 1½-inch return from the upper division, and a 1¼-inch from the lower. The steam supply to each division is automatically controlled and each chamber is piped so that each division can be controlled separately. At some points it was necessary to run steam and other pipes through the ducts, and at these points the ducts were enlarged.

The plant was installed by Frank Dobson, of New York, from plans drawn by Mr. Frank G. McCann, designing engineer, assistant to Mr. C. B. J. Snyder, Superintendent of School Buildings, Board of Education, New York City.

Mechanical Equipment of the New Police Headquarters, New York City

This building, now in the course of erection, is located on the old Centre Market site, between Centre street and Centre Market Place. The structure, to coin a new word, is "flatironical" in shape, measuring 48 feet on Broome street, 92 feet on Grand street, and has a mean length of approximately 316 feet. It consists of five floors, with basement and cellar, the roof being 88 feet above the curb. The roof will be adorned with a central colonnaded cupola, with a gilded dome, rising approximately to an extreme height of 175 feet from the curb. The Broome street end will



NEW BUILDING FOR POLICE HEADQUARTERS, NEW YORK CITY

have a private entrance, with a porte-cochère, while the main entrance will be on Centre street, near the center of the building.

The cellar, in which is located the mechanical plant, contains a range for pistol practice. As will be noted on the basement plan, this floor provides a large room for the property clerk, besides a prison for both male and female inmates.

The administration rooms and offices are located on the first, second and third floors, while the latter floor also contains two fair-sized trial rooms. A lost children's dormitory is located on the fourth floor, besides a large armory and drill room, the latter taking in a portion of both fourth and fifth floors.

Light, heat, ventilation and power for the entire building are furnished from a plant located in the cellar, which includes three boilers, with a total of 450 H. P., and three engine-generator units with an aggregate normal capacity of 250 kilowatts. The direct current, generated at a pressure of 115 volts, besides supplying all lighting, furnishes power for the electric elevators and three motors driving fans for mechanical ventilation.

The boilers, of the Heine water-tube type, generating steam at 150 pounds pressure, are arranged in one row, as shown on the cellar plan. From the rear of the boilers the smoke breeching is carried 48x52 inches to a brick-lined stack having an area of sixteen square feet. The McLean system of balanced draft, consisting of an engine-driven fan, regulating valve, damper regulators, etc., has been provided. This system is designed to throttle the heated gases before their entrance to the chimney, besides giving an added ventilation in the boiler room.

AUXILIARY APPARATUS

This apparatus consists of two 6x4x6 boiler-feed pumps, brass lined, and of the outside-packed pattern; Metropolitan injectors, automatic pump and receiver for handling the returns from the ventilating heater stacks, blow-off tank (3x8 feet), and a feed water heater of the open type. The two boiler feed pumps are cross-connected between the feed water heater and the above-mentioned receiver, so that water may be fed from either of these fixtures at will. The blow-off tank is cross-connected with the boiler feed pumps, so that the former may be drained to the sewer.

A 3-inch vapor pipe is run from blow-off tank to and extending up inside main chimney.

The feed water heater, purifier and receiver is, as mentioned, of the open type, having a 12-inch oil separator attached. Another 12-inch oil separator is installed in the main exhaust before the 12-inch branch (latter feeding heating system and to free exhaust) is taken off. This latter main runs 12-inch, with back-pressure valve to free exhaust, and 10-inch to heating system. A 4-inch live connection, with pressure reducing valve (with bypass), connects to an 8-inch line, which joins the 10-inch heating main through a 10x8 tee. From this main a 7-inch line is run to the heater stacks, and then an 8-inch and a 5-inch line for the direct heating system. The 7-inch line divides near the fans, a 6-inch line feeding west heater, with a 4-inch connection to east heater.

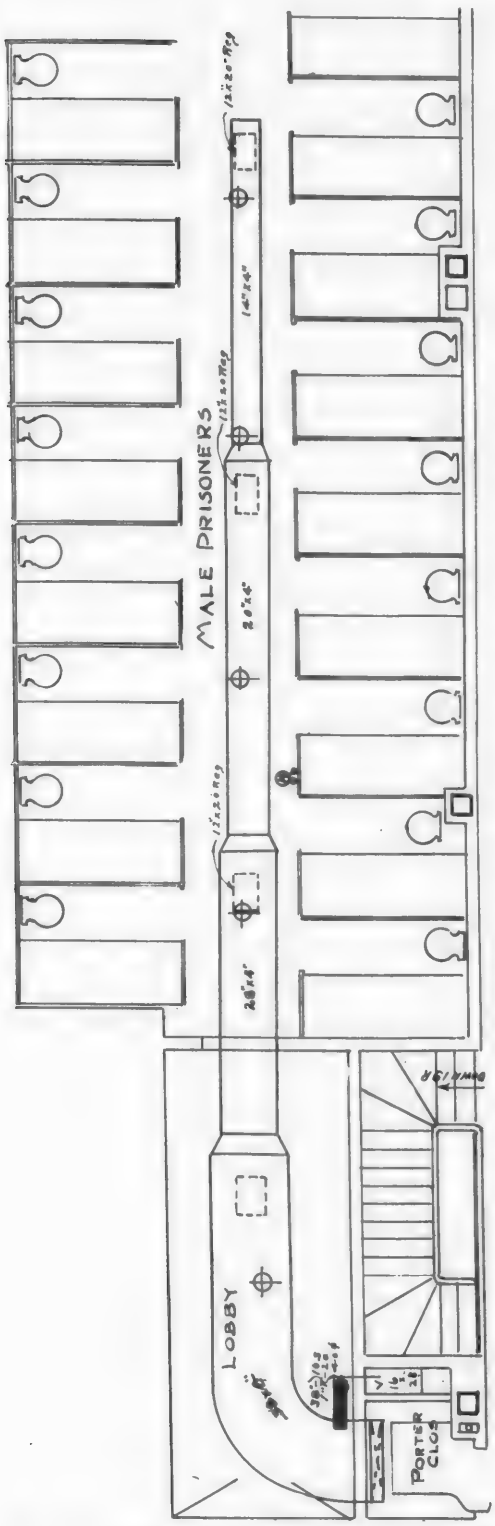
The returns from both heater stacks are brought back in a 4-inch line to the feed pump and receiver. The direct radiation returns enter the feed-water heater through a 6-inch line.

From the main steam header in the boiler room the live steam is carried in a 10-inch main to the engine room, where a 4-inch bend connection is dropped to the 50-kilowatt generator.

The 100-kilowatt engine generators are supplied through 6-inch bend connections. All of these connections are furnished with full-sized steam separators.

The exhaust line from engines is run in a trench to the feed water heater and receiver.

The high-pressure piping and fittings are of extra heavy quality and



MALE PRISONERS' WARD IN BASEMENT OF NEW POLICE HEADQUARTERS BUILDING, SHOWING VENT DUCT IN CEILING

guaranteed for a working pressure of 250 pounds.

HEATING AND VENTILATION

The entire heating of the building is by direct radiation installed on the two-pipe up-feed system, augmented by the Paul system.

In all there are 288 radiators, 42 rising lines, and a total radiation of approximately 15,900 square feet.

The indirect heating, or heating stacks for the ventilating system, consist of 2,600 square feet of heating surface. These stacks are provided simply to temper the air supplied by the fans to the nine rooms which are on the ventilating system. The rooms in which mechanical ventilation is provided are as follows: Property clerk's room and prisons in basement; the various commissioners' rooms on second floor; the trial rooms on third floor and the lost children's room and armory on fourth floor.

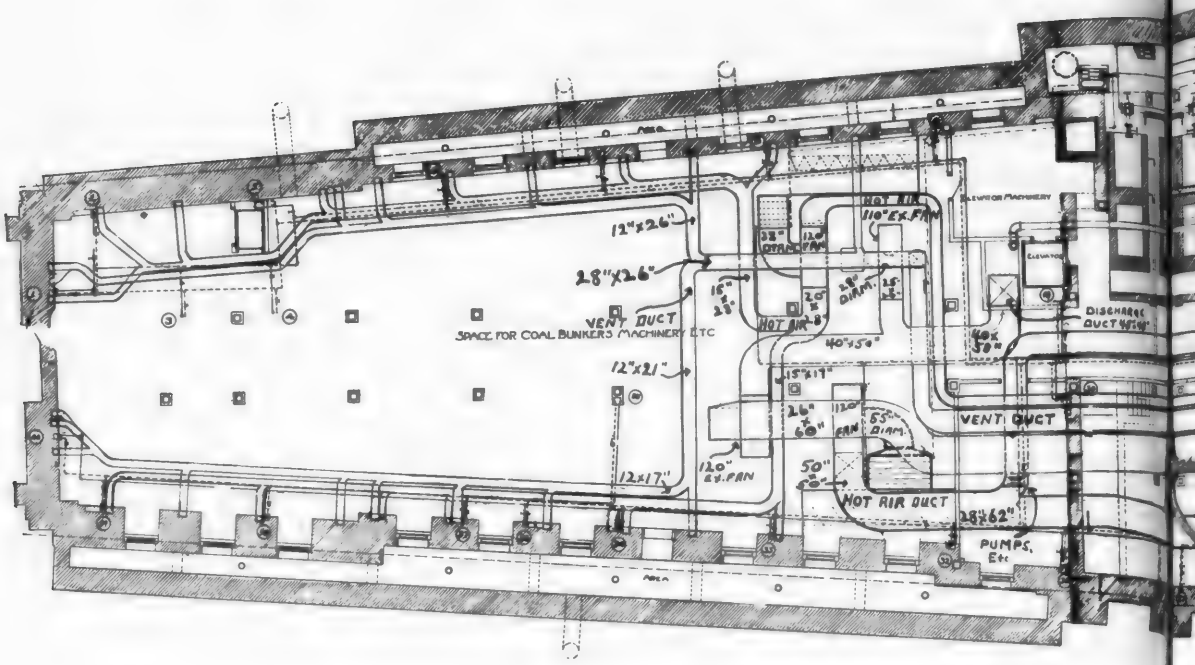
PARALLEL ARRANGEMENT OF VENTILATING APPARATUS

By referring to the cellar plan it will be noticed that the general arrangement of the ventilating apparatus and the duct system handling all this air is a parallel one. Both sets of supply and exhaust fans are arranged on the same shaft, and each set is driven by one direct attached motor.

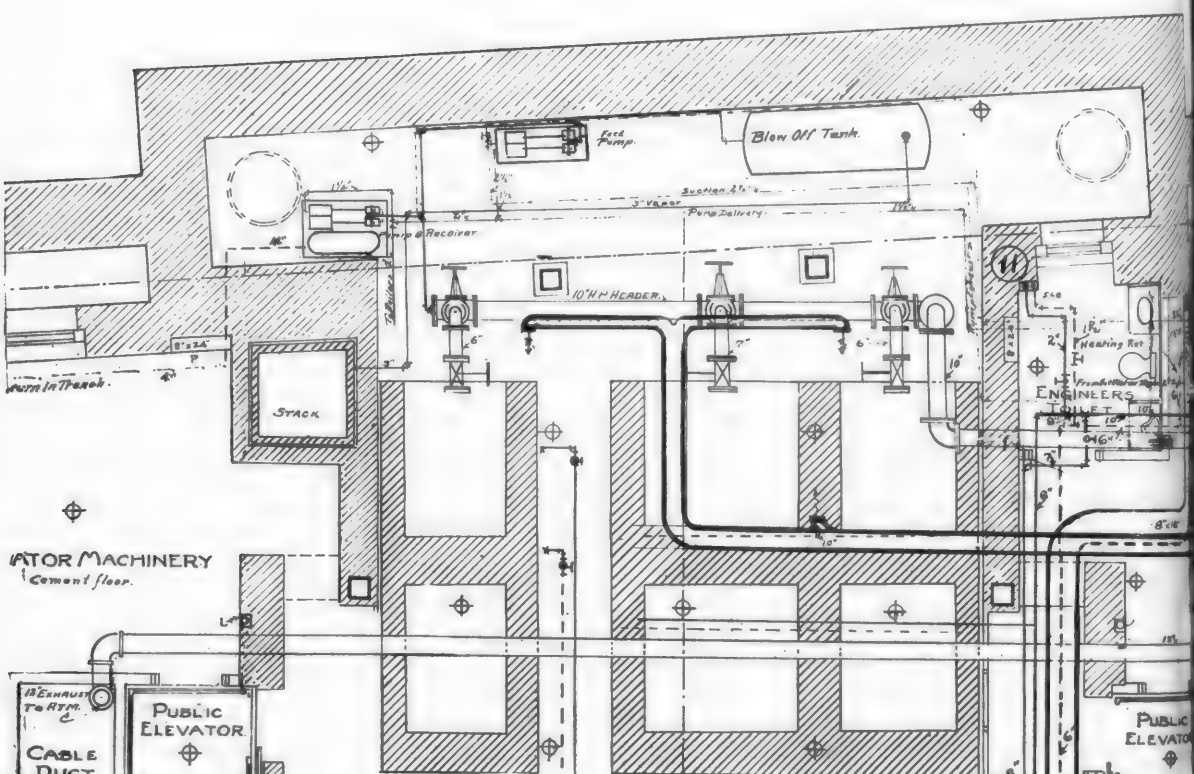
With the idea of effecting an economy in operation of power for driving the fans, the ventilating system has been divided into two units—one unit classified under "Constant Use," such as the prisons, commissioners' rooms, lost children's room and property clerk's rooms more constantly occupied; and the "Non-Constant Use," the latter embracing the trial rooms and the armory and drill hall. This latter system handles about three times the amount of air that is used in the "Constant Use" set.

In addition to the above ventilating system, a fan of the full-housed type has been provided to supply cool air to the engine and boiler rooms.

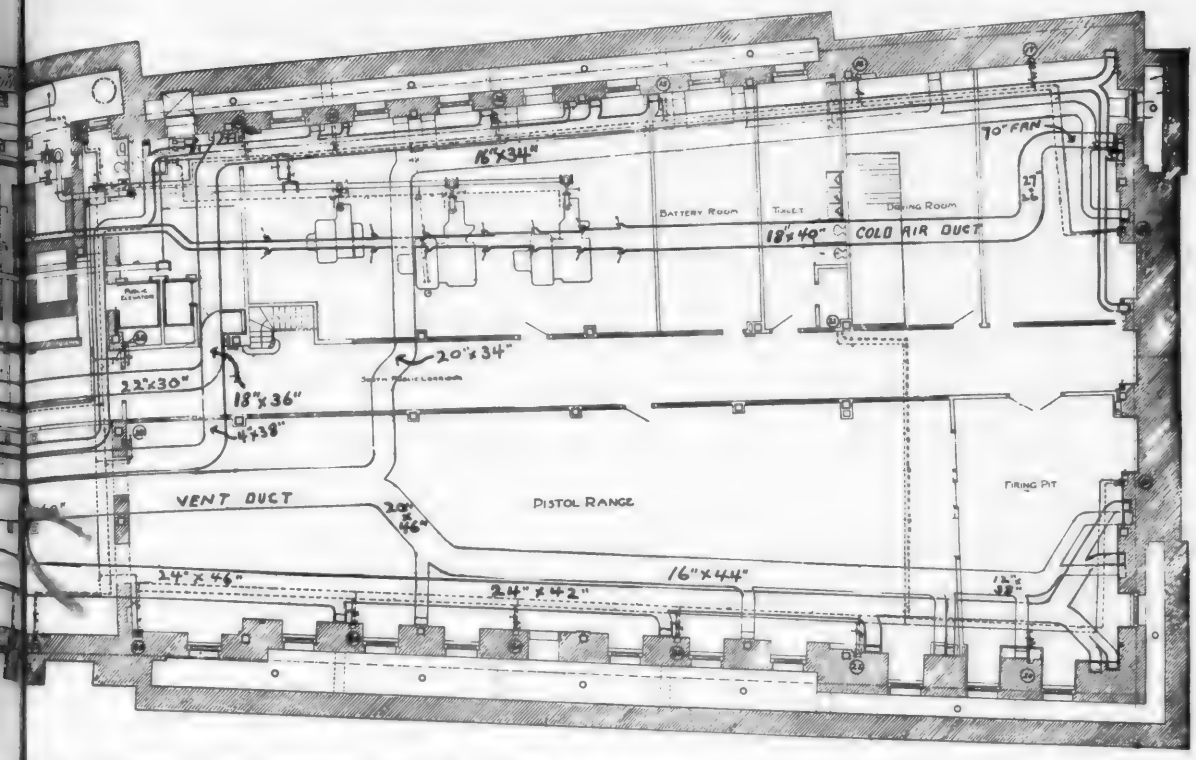
The ventilating fans for the main system are of the three-quarter-



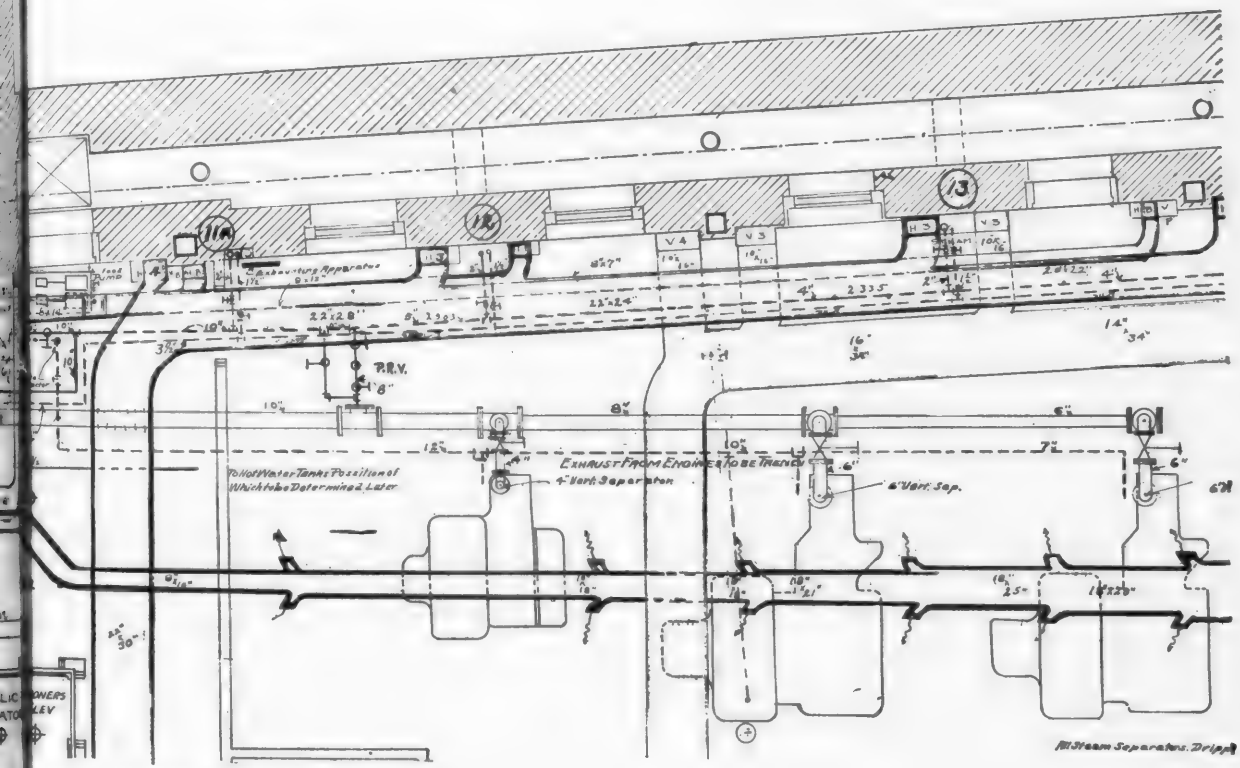
CELLAR PLAN, NEW POLICE HEADQUARTERS IN



SECTION OF CELLAR PLAN, SHOWI



ING, SHOWING ARRANGEMENT OF AIR DUCTS



OILER SETTINGS AND CONNECTIONS

housed type, with bottom scrolls and sides extended below the cellar floor. The shafting of both sets is arranged with friction-clutch couplings, so that either exhauster or supply fan can be thrown out of operation at will.

All motors are of the semi-enclosed slow-speed type, and are provided with regulating devices to obtain various speeds. The air, after its introduction into the building, and before its entrance to the heater stacks, is cleaned by a zig-zag arrangement of cheesecloth filtering screens.

An arrangement is also provided connecting into main exhaust duct near one of the exhaust fan inlets, so that the various cheesecloth filter frames may be readily cleaned. The frames are slid into the above mentioned duct connection and by agitating the surface of cloth the particles of dust are carried into the exhauster and blown up the foul air flue.

HEATER COILS

Two sets of coils are provided, one on the east side of the building, the other on the west.

Both of these sets consist of six sections of four 1-inch (i. d.) pipes set between 2½-inch to 2¾-inch centers. The west coil contains 5,052 actual lineal feet of 1-inch pipe, while in the east coil there is provided 1,740 feet of pipe. Each coil is provided with three independent steam heaters. As before mentioned, the returns from both coils are led back by gravity to the feed pump and receiver.

In general, the supply air register faces are set approximately nine feet above the floor, the exhaust faces being placed about 1½ feet from the floor.

The armory and trial rooms have top and bottom register faces for each air supply and vent flue.

Besides the regular coverings on all steam pipes, return and relief pipes, etc., the entire duct work in cellar is covered.

All other apparatus, such as heater casings and blow-off tank, is fully covered.

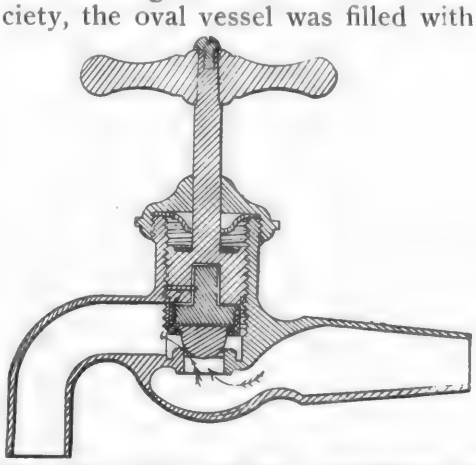
The building is being erected from the plans of Messrs. Hoppin, Koen & Huntington, architects, of New York. The complete steam, power, heat and ventilating plant above described was designed by J. Byers Holbrook, also of New York. The New York Steam Fitting Company is the contractor on the above work.

The Globe Valve—Its Origin and Development

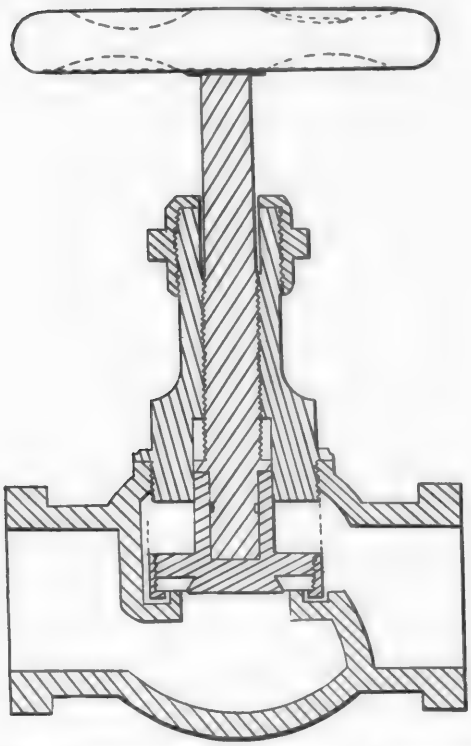
By J. O'Meara

To students of engineering history there is nothing that offers a more interesting study than the invention and development of the globe steam valve, so named from the shape of the case. Considering the universal use of this type of valve, it is hard to realize that its introduction took place scarcely fifty years ago.

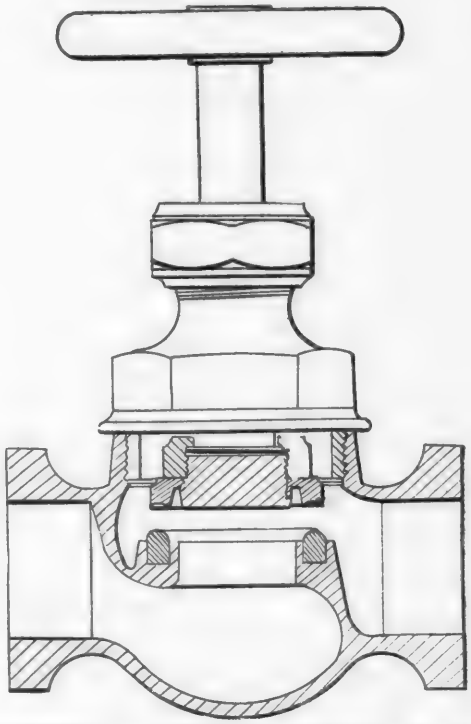
Dipping for a moment into ancient history, it is interesting to recall that the first actual working steam engine was introduced in 1698 by Captain Savery, an Englishman, a record of whose patent was made in the Royal Society transactions June 14, 1699. This engine was designed to raise water by aid of fire. In exhibiting the working model before the Society, the oval vessel was filled with



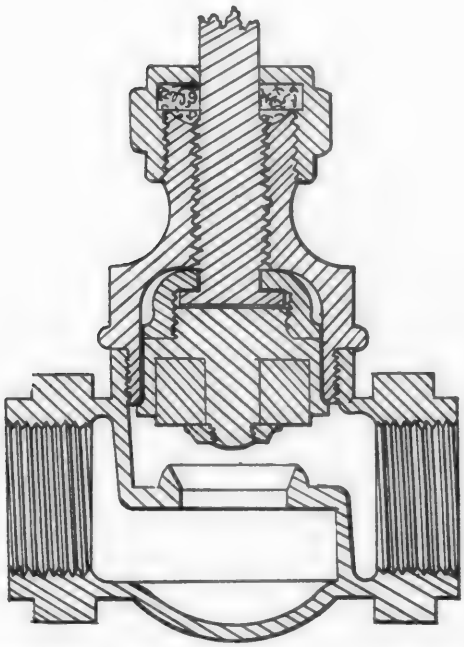
BIB COCK, WITH BRIDGE. INVENTED BY NATHANIEL JENKINS, IN 1865



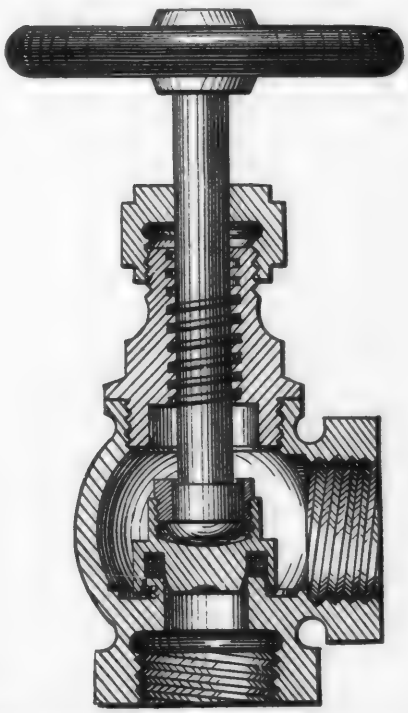
T. R. FANCHER'S PATENT, 1866, SHOWING RAISED SEAT, WITH DISK HOLDER



BURNETT & COMSTOCK'S PATENT, 1866, SO ARRANGED AS TO ALLOW THE DISK IN SEAT OF VALVE TO BE REPLACED



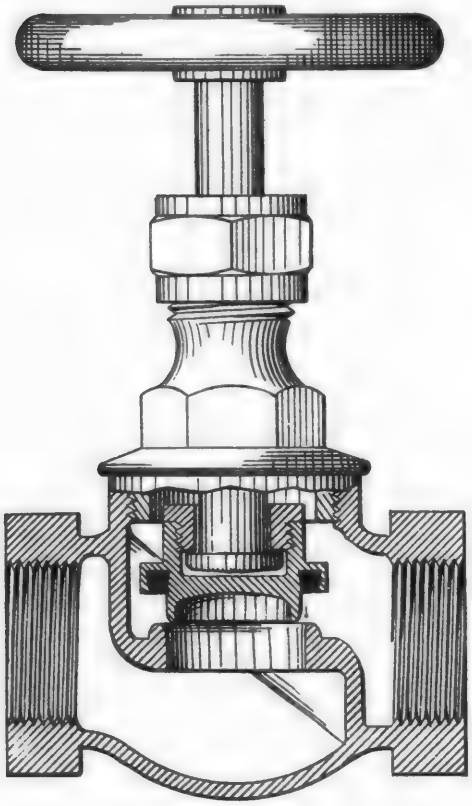
ORIGINAL JENKINS GLOBE VALVE. PATENTED IN 1868, BY NATHANIEL JENKINS



THE CRANE VALVE AS PATENTED BY R. T. CRANE IN 1876, SHOWING ARRANGEMENT TO PROTECT ALLOY FROM BEING CUT AWAY BY STEAM

water, and to this vessel a cock was attached.

Again in 1705, Thomas Newcoman, a blacksmith, and John Cawley, a

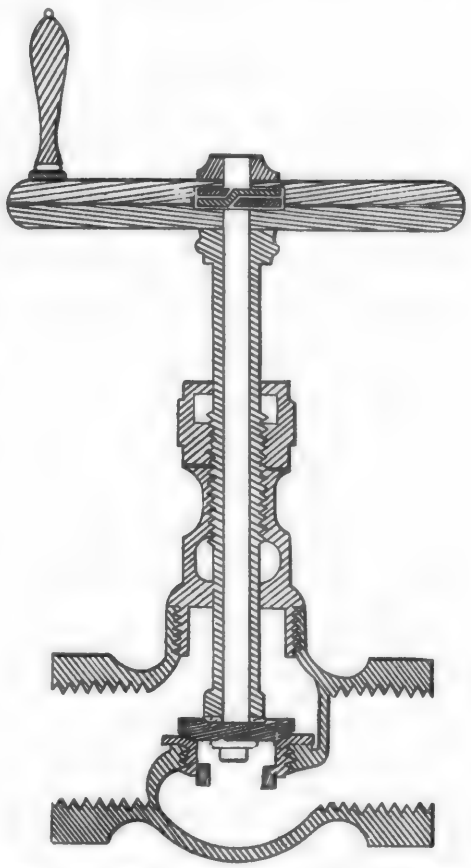


N. C. LOCKE'S PATENT, 1882, CONTAINING DISK HOLDER WITH EXTENSION BELOW PIPING

plumber, patented the atmospheric engine, which included among its appliances controlling cocks. Then came James Watt, whose first patent for steam engines, wherein controlling cocks were used, was taken out in 1769.

So much for the origin of the steam valve. With this little historical note for an introduction, and with the further statement that few important changes were made in the construction of steam valves, from that time until the middle of the last century, it will be easy to appreciate the situation in the valve world when the globe valve was introduced to the trade.

The engineering profession has united in giving credit for the idea of a globe valve to the late Joseph Nason, father of Carleton W. Nason, of the Nason Manufacturing Company. Mr. Nason introduced this type of valve early in the fifties. He was also the inventor of the Fox lathe, or what is now known as the Monitor lathe, consisting of from four to six tools, including dies, taps and cutters, thus doing away with the plug and working what is known as the bridge of a globe valve. This tool is now in universal use. Before the invention of the Monitor-Fox lathe, globe valves were made on a screw-cutting machine, and the labor alone on a one-inch valve amounted to as much as $1.50, instead of a few cents, as at present.

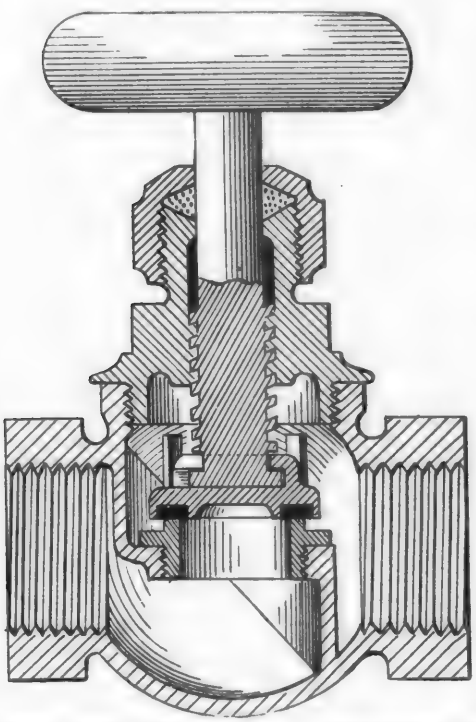


HENRY BURT'S PATENT, 1869, SHOWING REMOVABLE SEAT

Mr. Nason's valve aroused much interest in the trade and out of it. Among those who became interested in the subject was the late Nathaniel Jenkins, a keen New Englander, of

indomitable perseverance and far-sightedness. He constructed in 1865 a bib cock with a bridge, and then did what few ever thought of doing, where ordinary improvements in apparatus, such as bib cocks, globe valves, etc., were concerned, secured a patent on it. It is interesting to note that this patent was numbered 1979. That was forty years ago. To-day there are over 800,000 patents registered in the Patent Office at Washington.

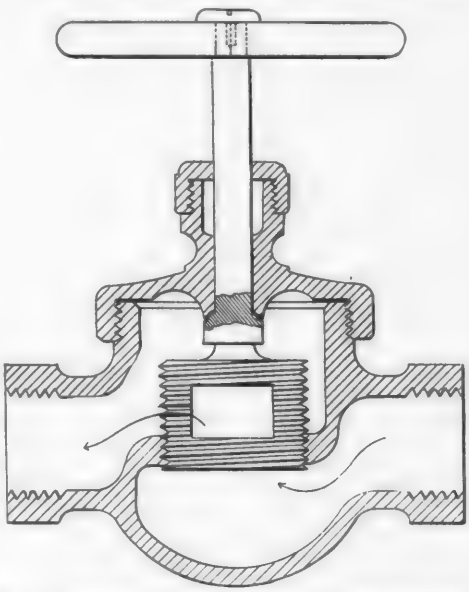
A year later, in 1866, T. R. Fancher, of Norwalk, Conn., took out a patent on a globe valve which had a raised seat, flat on its upper edge, with a disk holder to hold in place the rubber or leather disk. This patent was numbered 58,625, which shows the extraordinary stride that had been taken in scarcely a year by the inventive minds of America.



THE FAIRBANKS VALVE. PATENTED IN 1886, BY H. R FRISBIE

In the same year Burnett & Comstock patented a globe valve in which a piece of soft metal was imbedded in the seat of the valve and the disk was made of harder metal, the idea being to replace the disk in the seat of the valve with another disk when necessary. This feature, by the way, is one that is introduced to the trade from time to time nowadays as a new idea.

The original Jenkins globe valve



F. J. CARNEY'S PATENT, 1882, CONTAINING ONE OF BEST IMPROVEMENTS EVER PUT ON A VALVE

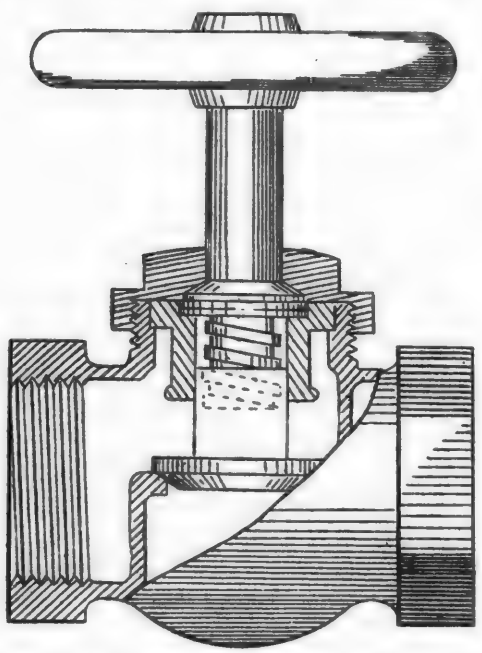
was patented in 1868 by Nathaniel Jenkins. This valve had a raised seat, beveled, making it very narrow on top. It contained a disk holder, with a disk made of rubber and held in place with a nut. The outer wall of this disk holder was so arranged that, in case the rubber disk was destroyed, the outer wall would come down and make a seat below the raise of the seat. The Fancher patent covered a raised seat and a disk. The value of the Jenkins patent lay in the arrangement for making a joint when the disk was destroyed.

In this form the Jenkins valve sprang into quick favor and, promoted through the remarkable perseverance of its inventor, attained an ever-widening sale as the years advanced, until to-day the name of Jenkins is known wherever the civilized or uncivilized language is spoken. While not the originator of the globe valve, to Nathaniel Jenkins belongs the credit of its universal use at the present day, as to Edison be-

longs the credit for the use of the incandescent electric lamp, invented long before his day.

The next important step in the development of the globe valve occurred in 1876, nine years later, when Richard T. Crane, of Chicago, invented a valve with a raised seat and disk holder, containing an alloy. This disk holder was so arranged that, when the alloy was destroyed or worn away, the outer wall made a seat below the raise. This claim, it will be noted, appears in the Jenkins patent, but Mr. Crane did not hold his alloy in with a nut. When the alloy was enclosed in the disk holder it was above the face of the disk holder, the object being to protect the alloy from being cut away by the steam when the valve was open. This is the valve now known as the Crane valve.

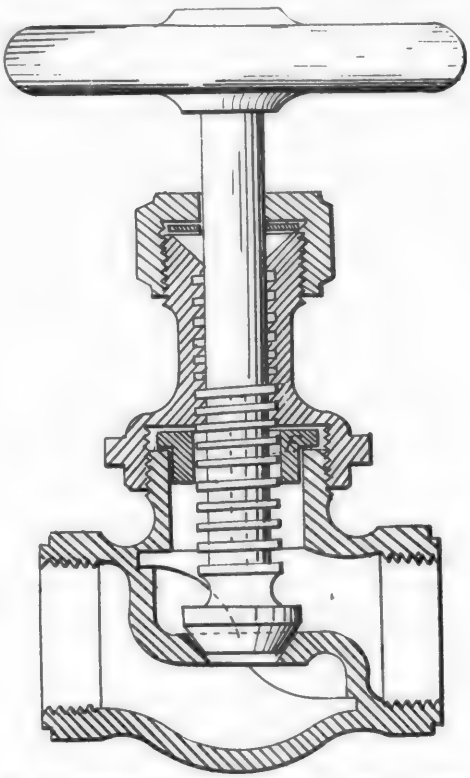
In 1882, N. C. Locke, of Salem, Mass., secured a patent on a valve of



WILLIAM S. COOPER'S PATENT, 1868, SHOWING REMOVABLE AND RENEWABLE WASHER AND CONTAINING THE THREAD ON THE VALVE STEM

practically the same construction as the Crane valve, with the exception that the disk holder was made with an extension below the piping to accomplish the same purpose sought by Mr. Crane—the protection of the disk. This valve was very popular and is still being sold in quantities throughout the New England States.

We hear much these days concerning removable seats in valves, and in this connection it is of interest to



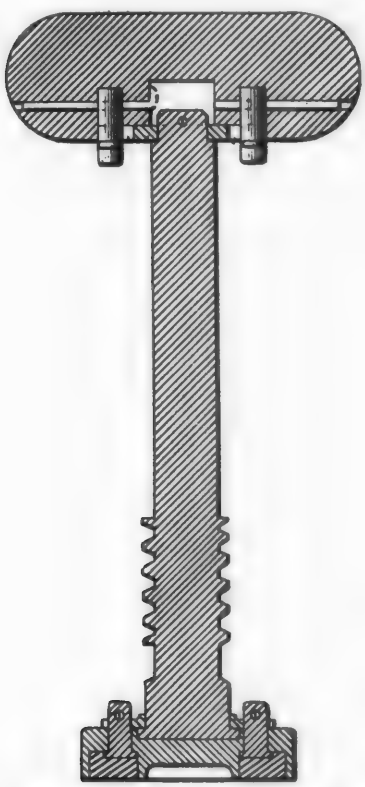
H. H. HENDRICK'S PATENT, WITH LOOSE INDEPENDENT GUIDE FOR STEM. TYPE OF PRESENT REGRINDING VALVE

note that in 1869 Henry Burt patented a valve containing this important feature. According to his device, if the seat were worn it could be renewed by screwing in a new seat. Regrinding features in valves had not then been thought of.

What is known as the Fairbanks valve was the patent of H. R. Frisbie, who entered same as assignor to Pratt & Cady Company, of Hartford, Conn. This valve, patented in 1886, has three guides, cast in the body of the valve. Its raised seat and disk holder slide up and down between these guides. The disk holder contains a washer of asbestos and rubber, held in place by the inner wall, spun out, and the outer wall, spun in. This construction renders it impra-

ticable to face off the disk, as in wearing away the ring of the inner and outer walls, the disk would be left with nothing to hold it in place. The disk is made of shredded asbestos and rubber.

In a valve patented by F. J. Carney, of Brooklyn, in 1882, the idea

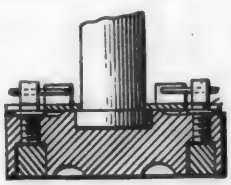


NEW TYPE OF RADIATOR VALVE WHEEL INVENTED BY J. O'MEARA

was used of constructing a collar on the stem for the purpose of shutting off the leak around the stuffing box, so that the valve could be packed or unpacked while the steam was on. This was one of the best improvements ever put on a valve, marking a very important step in its development, and has since been adopted by all valve manufacturers.

Another interesting patent was that of H. H. Hendrick, of Dayton, Ohio, who, in 1869, invented a valve provided with a loose independent guide for the stem, whereby the stem was held in place while the valve was being reground. This is a type that is now on the market.

The O'Meara valve, invented by the writer, represents one of the more recent developments of the steam valve. Mr. O'Meara was chief engineer of the old Union Club for twenty-five years, and in the silent watches of the night thought out many improvements that have met



THE O'MEARA DISK, INVENTED BY J. O'MEARA

with the approval of the steam engineering fraternity. Among Mr. O'Meara's numerous inventions of valves and steam fitting appliances is the O'Meara disk, the latest type of which was patented in 1905. In this disk, for use in high or low pressure work, the metal or rubber is imbedded in the disk holder with a recess on the back of the disk to receive the end of the spindle. A flange is placed on the spindle and bolted to the disk holder. This patent also includes a new radiator valve wheel, with a door-knob finish, that is calculated to save much burning of the hands and fingers of the user.

The next issue will contain a paper dealing with the origin and development of the reducing valve.—ED.

Meeting of English Heating Engineers

Sixty members of the British Institution of Heating and Ventilating Engineers attended the autumn meeting of the society, October 17, in the lecture room of the Institution of Mechanical Engineers, Storey's Gate, Westminster, London. Mr. George Crispin, of Bristol, took the chair.

The preliminary business included the election of a president to serve during the ensuing year. This honor fell to Mr. W. N. Haden, of Haden & Sons, Trowbridge. Mr. Haden is a member of the American Society of Heating and Ventilating Engineers, and is known to the engineering fraternity in this country.

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THE real launching of the work of the Standardization Committee, appointed by the Master Fitters' Association to investigate the subject of pipe threads, etc., took place October 26 last when the committee met in conference with representative pipe and valve manufacturers. At this meeting some of the enthusiasm of the originators of the investigation was communicated to those present in a way which left no doubt that a serious and determined effort, at least, will be made by the trade to comply with the committee's recommendations as outlined in its first report. Stripped of its details the portions of the committee's report that will attract the bulk of interest of the manufacturers, judging by the discussion in the conference, are the suggestion that each piece of pipe have stamped or rolled on it, at least once in each foot of length, some mark to designate the mill from which it came and whether it is iron or steel, and the other suggestion that in the manufacture of valves a standard dimension be adopted from face to face for standard sizes to be used up to 125 pounds and one for pressure up to 250 or 300 pounds.

INCIDENTALLY the conference developed considerable local color that was appreciated as much by the manufacturers as by the Master Fitters. The query contained in the letter of one manufacturer of fittings as to the necessity of the agitation in the light of the establishment of the Briggs Standard was on a par with a statement of a member of the committee that every complaint he had ever made, regarding the irregularities in the manufacture of steam fittings, was invariably met with the response: "This is the first time we have ever heard that complaint!"

The respects of the committee were also paid, good naturedly, to the jobbers who, in the competition of trade, were said to be the cause, to some extent, of the manufacture of inferior goods. Just how far the marketing of this class of goods has gone was best told by Mr. George T. Coppins, of the Walworth Manufacturing Company, who made a statement regarding the varying weights of valves now on the market that indicates a divergence which is either out of proportion as regards business economy or else as regards safety. He said, for instance, regarding the weights of some valves secured by his firm to fill orders when short of stock, that 1-inch radiator valves, which according to the Walworth standard weigh 3 pounds 8 ounces, weighed but 2 pounds, while 1¼-inch radiator valves fell from the Walworth standard of 5 pounds 2 ounces

to 3 pounds 1 ounce. Three-quarter-inch globe valves fell from 3 pounds 5 ounces to 1 pound 13 ounces, and 2-inch globe valves fell from 10 pounds to 8 pounds 6 ounces.

DETAILS of dry and wet return mains, such as those used in the draughting room at New York's Department of Education, are of value not only to the draughtsmen themselves but to all connected with the work, including the supply houses. In addition to this, they offer opportunities for a comparison of methods that can hardly help being beneficial to the profession. And now that the element of secrecy regarding methods is largely disappearing, as far as the better class of engineers is concerned, we are likely to see advances in this respect increase rather than diminish. Those who are in a position to contribute in this way to the knowledge of the art are serving their highest interests when they bring such matters to the attention of the trade. We are gratified to note that this view is indorsed to a large extent by the heating and ventilating profession, as a result of which our columns will contain many contributions which, in former years, would properly have come under the head of "secret methods," one of which will appear in the December issue.

ALL who read Mr. Konrad Meier's article in our last number on the subject of Overhead versus Underfeed in Hot Water Heating will be interested in noting our correspondent's remarks concerning the relative merits of the use of one and two pipe systems. Mr. Meier's advocacy of two-pipe systems is endorsed by a portion of the profession in the East, while in most parts of the West the profession does not hesitate to characterize two-pipe systems of this sort as more or less antiquated. We shall be pleased to receive additional expressions of opinion from our readers on this subject.

SEVERAL articles, which were scheduled for this issue, were unavoidably crowded out and will appear next month.

IT is not often that one is given a commission to lay out a heating and ventilating plant so unusual in shape as that designed for New York city's new Police Headquarters. This building is not only three times as long as it is broad, but is of the extraordinary length of nearly 320 feet. While the whole building is not ventilated, the portions that are require the carrying of the ducts quite to each end of the building. The illustration of the cellar plan, to be found on another page, is intended to give a general idea of the arrangement of the ducts.

THE program for the eleventh annual meeting of the Ohio Society of Mechanical, Electrical and Steam Engineers, held November 17 and 18, in Canton, Ohio, includes some papers of interest to the steam heating trade. One of these is entitled "The Heat Unit in Its Application to Steam Heating," by George B. Bennett, of the Bennett Engineering Company, Cleveland, Ohio. Another paper, by Ezra Fawcett, listed under the heading of Topical Discussions, deals with the setting of horizontal tubular boilers.

The Progress of American Schools in Regard to Health Laws*

From an English Engineer's Point of View

By J. D. Sutcliffe

A seven weeks' tour examining the schools of the Eastern and Central States of America raises at once a comparison with the schools visited when the writer was last in the States fourteen years ago. The progress in the provision for the health of the school children has been most marked and every care is now taken that the heating, ventilation, sanitation and fire appliances are of the most perfect description.

In 1891, when five weeks were spent by the writer in examining the schools in the Eastern States from an engineering point of view, the majority were warmed by hot air furnaces fixed in the basement on what was known as the "Smead System." This system has now been almost entirely superceded by steam and hot water heating combined with fan ventilation, but great credit is due to Mr. Smead for the educational and pioneer work done between 1885 and 1895, in raising the standard of comfort and health in American schools. No other man has done so much for the children, and in 1891 his system was in use in probably 90 per cent. of the schools in the Eastern States. It was never considered suitable for the English climate, as the air was passed over the outside of a furnace which warmed it to the required temperature, and English engineers considered such air too dry and too liable to have the nature burned out of it. America has evidently come to the same conclusion, and it is seldom one sees the furnace system except in the smallest village schools.

STATUTORY REGULATIONS FOR HEATING AND VENTILATION

The state of Massachusetts was the first to draft rules and regulations for the building of schools, and even in 1891 there were most stringent regulations regarding the heating, ventilation and sanitation of school buildings. The following extracts from their by-laws show this:

"1. The apparatus, with proper management, is to heat all the rooms, including the corridors, to 70° Fahr. in any weather.

"2. With the rooms at 70° Fahr. and a difference of not less than 40° Fahr. between the temperature of the outside air and that of the air entering the room at the warm air inlet, the apparatus is to supply at least 30 cubic feet of air per minute for each scholar accommodated.

"3. Such supply of air is to so circulate in the rooms that no uncomfortable draught will be felt, and the difference in temperature between any two points on the breathing plane in the occupied portion of a room is not to exceed 3° Fahr."

It will be noticed that the temperature is to be maintained "at 70° Fahr. in any weather." This is very stringent, and in the opinion of most English engineers is far too high. It must not be forgotten, however, that the percentage of humidity in the air is small compared with this country, and most people find that 70° is not more comfortable in America than 60° in England. The question of relative humidity is an important one in fixing the most comfortable temperature, and whereas records kept in American schools last winter show an average humidity of only 26 per cent., the humidity observations taken in the writer's office were never lower than 65 per cent., and the average for the winter months would be about 72 per cent.

EQUIPMENT FOR HEATING AND VENTILATING A TYPICAL CHICAGO SCHOOL

The Chicago schools were not examined on the previous visit in 1891, as it was understood the school buildings were far behind those of the Eastern States. This has now all been altered, and Chicago is paying great attention to the equipment of all schools built within its area. On an average twenty-five new twelve-roomed schools are built each year, and the Chicago Board of Education employ their own architect for these. In addition, they have appointed a special expert in heating, ventilation and sanitation, Mr. T. G. Waters, who has charge of this portion of the work and designs all the necessary equipment. He aims at, and secures, a very high standard of efficiency, and the following description of one of the most recent schools shows the amount of care taken to provide fresh air and comfortable working conditions for the children.

The school selected is a three-story building, 174 feet by 124 feet in plan, with twenty-seven rooms in addition to the rooms in the basement. It was designed by the architect to the Board of Education, Mr. W. B. Mundie, and erected under his supervision. The heating and ventilation and all matters pertaining to plumbing, gas fitting and sewerage, were designed and installed under the direction of Mr. Waters. The three floors are practically identical; there is a longti-

*Read at a meeting of the Institution of Heating and Ventilating Engineers, London, England, Oct. 17, 1905.

tudinal central corridor with the rooms at either side and a stairway at each end; the class rooms, eight per floor, are practically all of the same size, 27 feet by 32 feet, and each class room has a spacious wardrobe through which the group of flues in connection with the heating and ventilation rise for the rooms of that tier. Above the stairway of the main entrance, situated in what is really a mezzanine story, is the office of the principal, and over this, in the second story, is a library. The three central rooms of this part of the third story, it may be added, are formed by sliding blackboard partitions which, when rolled away, form an assembly room with a permanent stage on the opposite side of the corridor.

Air is distributed throughout the building on the plenum system. It is received by a double outlet fan in the center of basement, and discharged in opposite directions through both tempering and heating coils located immediately beyond; and the individual room supplies are carried from the warm air plenum chamber to the various groups of flues. The fan is run at a speed of 150 revolutions per minute, belt driven from a 9x 14-inch steam engine, and has a capacity under an assumed air pressure of ¾ oz. of about 25,000 cubic feet from each outlet per minute. Each outlet is provided, however, with a plate so that any desired quantity of the delivery up to 50 per cent. may be cut off. The air is carried from the plenum chamber through the small blast ducts to vertical flues and thence to the room inlets, each room supply being independent. The air is delivered about six feet above the floor level, but the area of the opening is such that a considerable reduction of the velocity of the incoming air is effected.

Among the requirements of the apparatus it is specified that the supply should amount to 1,800 cubic feet of air per hour per pupil, assuming an average occupancy of fifty-four pupils per room. The escape of air from the rooms is in general through side registers at the floor line in the wardrobes, this method providing for warming these rooms as well. The exhaust system is designed to provide for the discharge of about 75 per cent. of the inflow from the fan into the building, the rest of the air escaping through the numerous inevitable points of egress possessed by every building besides the open doors.

There are two boilers of the horizontal tubular type, 60 inches in diameter and 18 feet long, containing forty-eight 4-inch tubes, and a pressure of 45 pounds is carried.

The exact cost of this building could not be learned, but a similar new school which is just being completed is expected to cost £29.000, of which £2,400 is allowed for the warming and ventilating plant.

COMPARISON OF CHICAGO STEAM-HEATED AND FURNACE-HEATED SCHOOLS

Mr. Waters also gave the writer figures relating to two eight-roomed schools, each accommodating three hundred and twenty scholars and which were erected in 1894. One of these was heated by steam-heating apparatus and mechanically ventilated by means of fans. The other was heated by warm air from furnaces and ventilated by natural means only. The warming and ventilating plant in the first school originally cost £1,000, and in the furnace-heated school £640. The total cost of the bituminous coal used in the steam plant (price 10s per ton) amounted to £90 per year, while anthracite had to be burned in the furnace plant, costing 26s per ton, and the average cost of fuel was £200 per year. The steam-heated building was also less costly to maintain, the repairs to the plant from 1894 to date amounting to only £17, while £90 had been spent in the same time on the furnace heaters.

The Board of Education of the City of Chicago has not installed furnace heaters in any first-class school building for the past sixteen years, except the one referred to previously, and this is an addition to an existing building which was heated by furnaces and the character of which was such that the introduction of modern steam heating and ventilating plant to heat both buildings was not permissible.

Although one must admire the thoroughness with which the whole subject of heating, ventilation and sanitation has been studied, and the results obtained, one cannot altogether agree with the methods that are most in favor. As an example, all the heating surface is placed at one point in the basement. Now they frequently get temperatures of 40° to 45° Fahr. below freezing and this means that the hot air has to be delivered into the rooms at a temperature of from 150° Fahr. to 170° Fahr. in order to maintain an average temperautre of 70° throughout. It cannot be considered good practice, and doubtless in time the methods will be modified to avoid such high initial temperatures.

NEW YORK SCHOOLS

Turning now to the city of New York, similar stringent rules affecting the comfort, health and safety of school buildings are in force. The city has its own Board of Education and this Board has its own architect. It also appoints a chief engineer, who is a trained man and designs all the heating, ventilating, sanitary and fire prevention appliances and sees to their proper application. The Architect's Department, under Mr. C. B. J. Snyder, is now spending over a million and a quarter pounds sterling each year in building new schools and in bringing the older

schools up to a reasonable degree of effectiveness for their work.

The writer had the pleasure of inspecting the "New High School of Commerce," and there is certainly no school in England, excepting perhaps the Manchester School of Technology, that can compare with it either in beauty of design or in wealth of equipment for the purpose intended. The building is five stories high with basement, and has a frontage of 150 feet on Sixty-fifth street and 100 feet on Sixty-sixth street, and will accommodate 1,630 students. The contract price for the school was £60,500, but it has cost with additions over £70,000.

Practically it serves the same purpose as the Manchester Whitworth Street Secondary School, but there the comparison ends. The basement contains a fine restaurant where food is supplied at cost price, a swimming bath 50 feet by 30 feet, a fine gymnasium with a gallery round asphalted and banked to serve as a running track, besides the fans, boilers and engines necessary for supplying the fresh air, heat, steam, hot water, and for driving the elevators. Two elevators run continuously from basement to the fifth story, and a class of forty are taken up or brought down at the same time. The steam supply is furnished by four boilers, 18 feet long and 4½ feet diameter, while the conveyance of coal to the boilers and the removal of ashes from them is by an overhead trolley track which saves a great amount of floor space.

It was specified that the whole building was to be kept at a temperature of 70° Fahr. in any weather, and the fans are large enough to supply fresh air at the rate of 1,800 cubic feet per hour for each pupil in the building. This air is only delivered at a temperature of 68°, the real warming being done by steam-heated radiators fixed in each room.

The radiators are all controlled automatically, so that if the temperature in any part gets above 70°, the nearest radiators are partially closed off, while if it sinks below 70°, the steam supply is increased. This is much sounder in principle and design than the Chicago method of concentrating all the heating surface at one point, as the air is forced into the rooms at normal temperature.

The lighting is by electricity generated by a complete plant of dynamos and high speed engines on the premises, and this is the case with most New York schools, although occasionally it is obtained from one of the supply companies. An interior telephone system is so arranged that the principal can be in constant touch with all parts of the building.

In a crowded city like New York, the playground problem is a very serious one. In this country we require a minimum unbuilt or open space for a playground equal to 30 square feet for each child. In New York the architect is pleading for a minimum playground space of at least 5 square feet per child, but in some of the most crowded areas it is almost impossible to get this.

Considerable precautions are taken to minimize fire risks, and the new schools are all in direct electric communication with the fire stations. All school doors open outwards and are fixed with automatic bolts so that it is only necessary to push against them from the inside for them to fly open. The scholars are regularly drilled in fire exercises, and at the High School of Commerce the building can be cleared in less than four minutes.

BOSTON SCHOOLS

In Boston the writer had a long and interesting talk with Professor Woodbridge, who is recognized as an authority on the warming and ventilating of American school buildings. He recently designed a very effective plant for the Senate House at Washington, and is a great advocate of the plenum system of combined warming and ventilation. Speaking to him of the difficulties of keeping the ducts clean and free from dust, Professor Woodbridge said that he had made numerous tests of this dust and had always found it perfectly harmless. His theory was that with the large volumes of air passed through these ducts the oxygen so thoroughly purified the dust and dirt that no harm could possibly come from it.

The writer spent one whole day in examining the new Harvard Medical Schools, Boston, which are fast approaching completion. There are five huge schools in separate blocks and a large power house occupying another block similar in design to the schools. Each block is three stories high, and some idea of the equipment may be gathered from the fact that ten fans, each 15 feet in diameter, are used for supplying fresh air to the various rooms, and thirty-two fans, 7 feet in diameter, for exhausting the foul air. The heating of the building is on what is known as the "Forced Hot Water System." That is, water is heated by exhaust or live steam and then forced through pipes and radiators, completing the circuit back again to the heaters. The circulation in the pipes is so rapid that in sending the water round a circuit of two and a half miles it only drops about 7° Fahr. in temperature. Some idea may be gathered of the enormous size of these buildings when I say that 104,000 square feet of heating surface is used for warming the buildings, about half of the surface being placed close to the fans and the other half distributed in the form of radiators in the different rooms and corridors.

The filtering of the air has received

considerable attention, and each fan has its own air supply and its own filter. The filter for each fan consists of 260 bags or sacks 6 feet long and 10 inches in diameter. Fresh air enters at the front of the bag, and must, of course, pass through the fine canvas bag before it can reach the fan. The bags are easily taken down and cleaned or washed and others take their place while this is being done.

NEW LEGISLATION

The state of New York (as distinguished from the city of New York) last year passed an act to "Amend the Consolidated School Law relative to the proper Sanitation, Ventilation and Protection from Fire of School Houses." This act is very drastic in some of its provisions, and insists on all plans deposited with the Board of Education showing in detail the proposed heating, ventilating, lighting and sanitation. The act goes on to say, "The Commissioner shall not approve any plans that do not provide at least 15 square feet of floor space and 200 cubic feet of air space for each pupil. Provision must also be made for assuring at least 30 cubic feet of pure air every minute per pupil, and the facilities for exhausting the foul air shall be positive and independent of atmospheric changes." This, of course, means that no school can be built without providing mechanical ventilation of some description. The fire protection clauses are worth quoting, as these matters are entirely neglected in many English schools, and it is a custom in some schools to lock the outside doors—a most reprehensible practice. "All exit doors shall open outwardly and shall, if double doors are used, fasten with moveable bolts operated simultaneously from the inner face of the door. No staircase shall be constructed except with straight runs, all changes in direction being made by platforms. No doors shall open immediately upon a flight of stairs, but a landing, at least the width of the door, shall be provided between such stairs and such doorway."

The state of Pennsylvania has so recently as the 22d of April last, passed an act, entitled "An Act for the purpose of governing the construction of Public School Buildings in order that the health, sight and comfort of all pupils may be protected." The act declares that "Whereas it is of great importance to the people of this Commonwealth that Public School Buildings hereafter erected by any Board of Education or School Trustees shall be properly heated, lighted and ventilated. No school house shall be erected in this state until the plans, specifications, etc., for the same showing in detail the proper heating, lighting and ventilating of such building have been approved.

"Light shall be admitted from the left or from the left and rear, and the total light area must equal at least 25 per cent. of the floor space. Each classroom shall have at least 15 feet of floor space and not less than 200 cubic feet of air space per pupil, and shall provide for an approved system of heating and ventilation by means of which each classroom shall be provided with fresh air at the rate of 30 cubic feet per minute for each pupil, and warmed to maintain an average of 70° Fahr. in the coldest weather."

These new acts show that the school authorities in America are keenly alive to the necessity of healthy school buildings, and one cannot help asking when our education authorities are going to wake up to the vital necessity of fixing some definite health standard for all our schools.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS
WHO HELPS ME I HELP

Conference of Standardization Committee and Manufacturers

The first conference of the Standardization Committee, with representatives of pipe, valve and fittings manufacturers, took place October 26 last in the rooms of the American Society of Mechanical Engineers, New York. Among those present were the members of the committee, Arthur C. Walworth, of the Walworth Construction Co., Boston; Burton P. Hall, of the New York Steam Fitting Co., and E. M. Nichols, of Philadelphia; also, C. G. Cornell, Jr., for Spang, Chalfant & Co.; T. B. Belfield, H. Belfield & Co.; Frank N. Speller, National Tube Co.; M. E. Kennedy, Kennedy Valve Co.; H. D. Gordon, Jenkins Bros.; Russell Bonnell, Nelson Valve Co.; H. Ritter, Lunkenheimer Co.; J. J. Quinlan, McNab & Harlin Co., and George T. Coppins, Walworth Mfg. Co.

The trade press was represented by Frank K. Chew, Joseph Graham, A. S.

Barnes, and A. S. Armagnac. Letters were read from a number of manufacturers not present who stated their intention of sending representatives. After the conference was called to order, Arthur C. Walworth, chairman of the Standardization Committee, was made chairman of the conference, and Henry B. Gombers, secretary.

After reviewing the work of the committee, which has already been presented in these columns, Mr. Walworth submitted a report which, he said, was intended as a suggestion for future action.

THE COMMITTEE'S REPORT

The Committee on Standardization of the National Association of Master Steam and Hot Water Fitters have had several meetings, and have endeavored to obtain the best ideas of the leading Master Steam Fitters and Contractors who are engaged in the erection of apparatus containing pipe, fittings and valves, and who are, therefore, conversant with the defects and drawbacks of the present "go-as-you-please" system of weights and dimensions.

We have formulated below the salient features of the recommendations received by us, and asked the manufacturers to especially consider these points, and to assist us in arriving at some definite result which shall be to the mutual advantage of producers and users.

We advise and ask that all Merchant Pipe be made to conform with card weights as published—that each piece of pipe have stamped or rolled on it, at least once in each foot of length, some mark to designate the Mill from which it came, and whether it is Iron or Steel.

That you conform absolutely to the Briggs Standard of threads; that you limit the size of Butt Weld to 2 inches and smaller; and that you abandon the manufacture of 3½, 4½, 7 and 9 inch sizes.

In the manufacture of Cast Iron Screwed Fittings we ask that you take measures to insure absolute uniformity in tapping as to diameter and alignment.

That you adopt a uniform standard of dimensions from face to face and face to centers, as well as thickness of boss and bodies.

That in the manufacture of Flange Fittings you conform to dimensions for standard flanges as to diameter and thickness; uniform thickness of bodies, and adopt a uniform standard for dimensions face to face and face to center. That all drilling be made in conformity with a single Standard as given for pressures under 125 pounds in the standard adopted, except that Flanges for 4 inch sizes be drilled with eight holes for ⅝ inch bolts instead of four holes for ¾ inch bolts, as at present, but on the same Bolt Circles.

For extra heavy Flange dimensions it may be advisable to make some changes, as at present it appears to us that they are susceptible to much modification.

That in the manufacture of Valves you adopt a standard dimension from face to face for Standard sizes to be used up to 125 pounds and another for pressure up to 250 or 300 pounds.

That you make a Standard size of Hexagon on Screwed Valves, and make all Flanges to conform with the adopted sizes for Flange Fittings; also a standard diameter of stem, a standard diameter of stuffing boxes and a standard thickness of shell are desirable.

That finally you abandon the manufacture of 3½ inch, 4½ inch, 7 inch and 9 inch sizes, and place on all articles some registered Trade Mark.

It is the intention of this committee that our final conclusions be published as widely as possible, and placed in the hands of all engineers and architects, or others who design and prepare plans and specifications, asking them to observe them in their work, and we ourselves pledge every effort to encourage in the way of Trade and influence the successful carrying out of these recommendations.

"All steam fitters," said Mr. Walworth, "wish to have a valve that will be of a standard weight. If we can have the trade-mark of every valve manufacturer stamped on every valve, assuring us of standard weight, we shall know what we are buying, and if anyone wishes to buy the cheap valve he will simply buy an unmarked valve which will have no guaranty."

PREVIOUS EFFORTS TO STANDARDIZE VALVES

Mr. Coppins: Five or six years ago we had an association of brass and iron manufacturers and Mr. Kelly brought to the attention of the association the fact that while we were making out a scale of discounts any such scale would not be fair unless the weights and general finish of the valves were stated; that while some of the manufacturers made a line of valves much heavier than others they were held to the same scale of discounts as the firms making the lighter valves. The latter were, therefore, given an advantage, and if they saw fit to cut the price they could do so and still be able to make a profit. When you stop to consider that with the price of copper 16¼ cents to-day, and one man making an inch valve five ounces less than another man's valve, each ounce in that valve must of necessity represent fully one cent or more, and that means a difference in the prices all the way from ten to twenty per cent. in favor of the man making the lighter valve.

Just about the time that Mr. Kelly and others suggested this, we drifted into a misunderstanding, and that sort of thing was entirely abandoned, and then

it became a question of how light the valves could be made. This has gone on to a great extent so that a gradual reduction has been made in the weight of valves that are used especially for South American trade. A 1-inch valve for South American trade to-day weighs at least from seven to nine ounces less than the same valve was supposed to weigh five years ago.

Mr. Coppins said that only a short time ago, when short of stock, his company had gone into the open market for certain sizes of valves, and found that the valve corresponding to the Walworth Company's one-inch radiator valve was one pound and eight ounces lighter. The differences in weight were proportionate on other sizes.

Mr. C. G. Cornell: We have not found any practical way of marking the pipe in the manufacture. We simply stencil the larger sizes.

Mr. Hall: The stenciling is a very poor method, and it is generally impossible to find enough of the stencil left to learn from where it came. If the pipe cannot be marked other than by stenciling it is of no use.

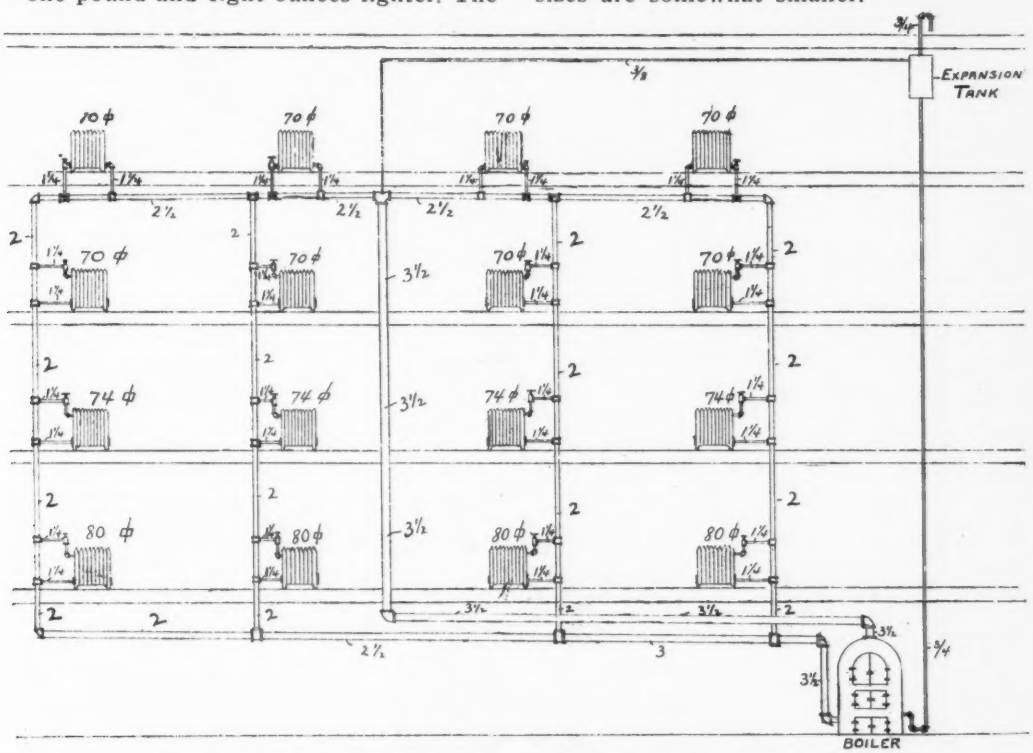
On motion it was resolved to enlist the interest and aid of the following bodies in the effort to standardize valves and fittings: Valves and Fittings Manufacturers' Association, Malleable Iron Fittings Association and Pipe Die Manufacturers' Association.

The conference was then adjourned.

Overhead Hot Water Heating

Editor HEATING AND VENTILATING MAGAZINE:

I was much interested in Mr. Meier's article in your October issue. There are, however, some features regarding his methods that are somewhat different from my own practice, at least. I have illustrated these differences in the accompanying sketch, which was drawn after a study of Mr. Meier's layout for a four-story overhead hot water system. (Page 2, October issue.) You will note that I have but two return risers on each branch, instead of four, and that my pipe sizes are somewhat smaller.



ARRANGEMENT OF PIPES FOR OVERHEAD HOT WATER HEATING

As regards the return risers, I see no necessity for using more than those I have indicated, nor would I carry the supply riser above the fourth floor.

A. C. M.

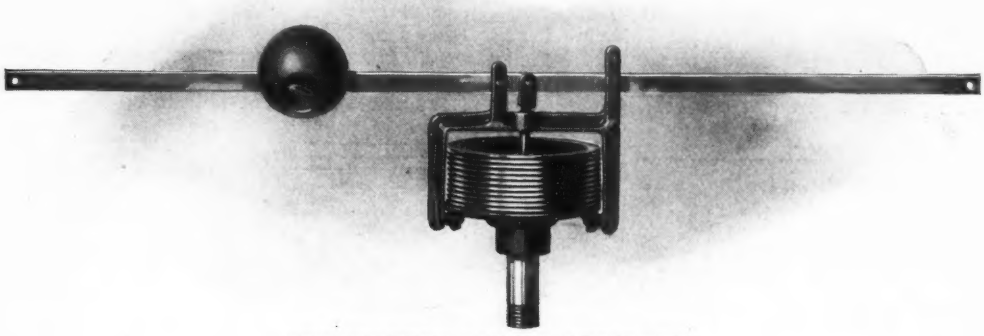
Chicago, Ill.

NEW DEVICES

Improved Damper Regulator

An improved damper regulator, designed to serve as an extra sensitive, reliable and durable controller of the draft dampers of steam boilers, has recently

been placed on the market by the American Radiator Company. It is known as the Ideal Sylphon No. 20 Damper Regulator for steam boilers. The regulator is composed entirely of metal. It is frictionless, and has been found to be highly sensitive. It is made upon the bellows plan, and is formed of two brass disks with accordion sides, made of steam

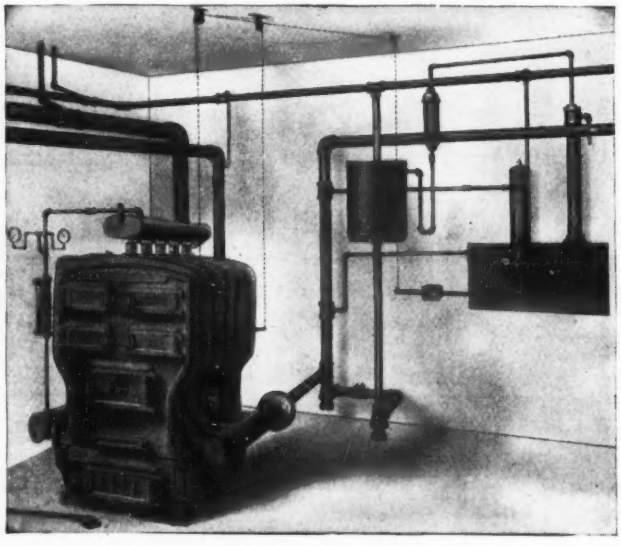


THE SYLPHON DAMPER REGULATOR

brass. The accordion sides are formed of ten deep poles which permit of ample, yet very sensitive, expansive effect upon the vertical rod that connects the top of the bellows to the bar upon which the counterbalance weight is placed. The sides are not built up of separate disks, but are formed from a single piece of brass, thus preventing leakage through joints. The top of the bellows is an inflexible brass disk, and the action of this disk is governed by the pressure of the steam under it operating to expand or contract the flows of the sensitive brass sides. The top and bottom disks of the bellows are made of brass, pressed into concave shape to make them absolutely inflexible. The bellows is fed by a 1-inch opening in the bottom plate of the bellows, which is 5¾ inches in diameter and 2¼ inches high at rest. The lever is 37 inches long, and the complete regulator weighs 10½ pounds, including bar and weight.

K-M-C Vacuum System

The accompanying illustration shows the latest development of the floating check construction of the K-M-C Vacuum System (Morgan Patents). In this construction it will be seen that the air main, the highest pipe shown in the cut, is composed of two 1-inch sections. It pitches downward from the extremity of each section about 1 inch in 15 feet to the tee directly above the accumulating tank. The air return of 1-inch pipe continues from the bottom of the tank through a swing check valve to the boiler. The floating check is connected to the end of the long leg of the trap and a ½-inch pipe is run upward from its upper opening, thence downward to the mercury column attached to the wall, the side opening of which is well above the water line of the boiler. An air vent pipe is shown connecting the lower opening of the regulator to the air main. An air vent pipe also connects the vertical drop of the return from the shortest steam circuit to the air main above it.



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FLOATING CHECK CONSTRUCTION FOR K-M-C VACUUM SYSTEM

The thermometer is placed in the front of the boiler, its bulb being surrounded by steam. The steam and vacuum gauges are so piped as to be protected by traps from contact with the steam. A safety valve is essential in this system.